

AMERICAN BOSCH SERVICE STATIONS

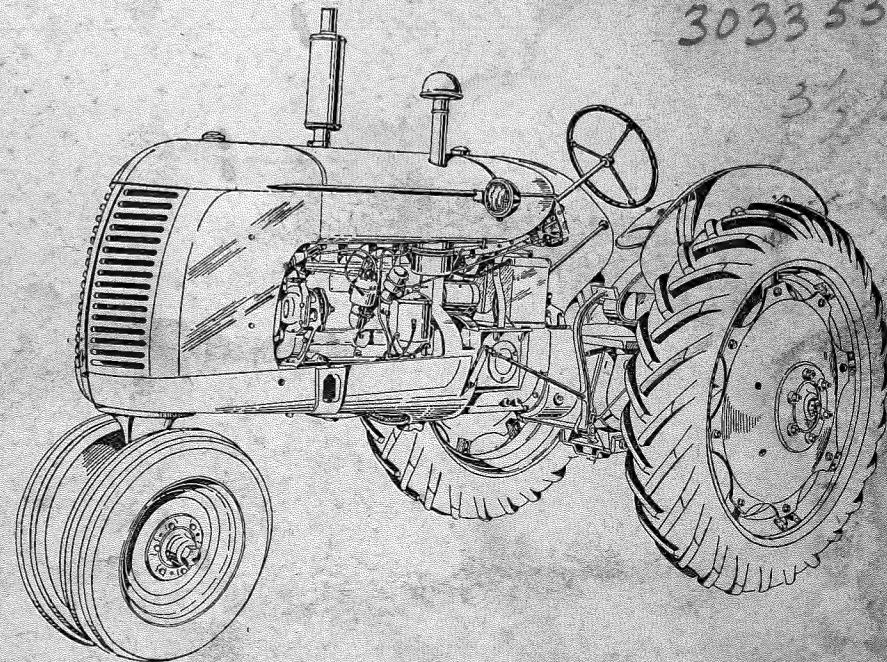
Aleppo	SYRIA	Syegh Brothers (Cesar Syegh)	P.O. Box 134
TANGANYIKA			
Arusha Dar-es-Salaam Iringa	The Motor Mart & Exchange Ltd. The Motor Mart & Exchange Ltd. The Motor Mart & Exchange Ltd.	P.O. Box 58 P.O. Box 402 P.O. Box 42	
TUNISIA			
Tunis Tunis	Comptoir De L'Electricien Charles Salis Etablissements E. Anduze & Cie.	34, Rue Thiers 31, Avenue de Carthage	
TURKEY			
Istanbul	M. Pireloglu ve A. Kesisoglu	Yeni Cami Omerago Sokak 27, Galata	
UNION OF SOUTH AFRICA			
Cape Town, Cape Province East London, Cape Province Kimberley, Cape Province Port Elizabeth, Cape Province Durban, Natal Johannesburg, Transvaal Pretoria, Transvaal	Stansfield Ratcliffe & Co. Limited Stansfield Ratcliffe & Co. Limited	105 Strand Street 179 Oxford Street 95 du Toitspan Road 115 Queen Street 101/5 Pine Street 29-31 Simmond St. Ext. 452 Church Street	
URUGUAY			
Montevideo	Antonio Manzione S.A.	Rio Negro 1531 Al 1533	
VENEZUELA			
Caracas	S. A. Eugene Capucio y Cia.	San Francisco a Sociedad 8	
Maracaibo Caracas	Daniel E. Rincon Maquinarias Mendoza	Apartado No. 34 Apartado de Correos 2641	

Operating Instructions

for

CO-OP "E3" TRACTOR

GASOLINE, DIESEL and DISTILLATE



**NATIONAL FARM MACHINERY
CO-OPERATIVE INC.**

BELLEVUE, OHIO

INDIANA FARM BUREAU COOPERATIVE
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FARM BUREAU SERVICES INCORPORATED
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FARMERS UNION STATE EXCHANGE
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CANADIAN COOPERATIVE IMPLEMENTS LIMITED

WINNIPEG

REGINA

SASKATOON

CALGARY

EDMONTON

FOREWORD

Your tractor has become your partner and will amply return the investment you placed in it. Years of thought and experience and close contact with farmers have resulted in the many refinements and features built into the tractor. It has been carefully manufactured under close supervision and careful inspection and if it is given the care and service outlined in this manual, years of trouble-free operation will result.

BEFORE OPERATING YOUR NEW TRACTOR STUDY THIS MANUAL CAREFULLY

If you feel that you require information not contained in this manual consult your dealer who has the trained personnel and the required equipment to give you the service you require. All dealers are kept informed on the best methods of handling your tractor problems and their mechanics have the training and experience on your tractor to give your problems personal attention and quick satisfaction.

Dealers carry ample stocks of genuine parts and in turn are backed by the full facilities of the Company with Branches and Distributors conveniently located. When parts are required be sure to give the dealer your engine and tractor serial numbers. It is suggested that you write these in the space provided below.

Tractor Serial Number

Engine Serial Number

It is the policy of the Company to make continuous improvements in their products, the Company reserves the right to make these changes at any time without incurring obligation to add them to any tractor already sold.

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TRACTOR CHECK CHART

The following five operations must be performed before the tractor is unloaded from flat car or truck.

1. Check tire pressures:
(a) Front 28 lbs. (5.50 x 16)
(b) Rear 12 lbs.
(See page 49.)

2. Check oil level in the crankcase

3. Install drain cocks and fill the radiator

4. Check the battery for water, also check battery connections

5. Check the tractor for any parts lost, stolen or damaged in transit and make claim for same on the carrier.

PRE-DELIVERY CHECK CHART

Dealer's Signature



ACCIDENTS CAN BE PREVENTED WITH YOUR HELP

RULES FOR SAFE TRACTOR OPERATION

(Prepared by the Farm Safety Committee of the Farm Equipment Institute and approved by the National Safety Council, Incorporated.)

1. Be sure the gear shift lever is in neutral before starting the engine.
2. Always engage the clutch gently, especially when going up a hill or pulling out of a ditch.
3. When driving on highways, or to and from fields, be sure that both wheels are braked simultaneously when making an emergency stop.
4. Always ride on seat or stand on platform of tractor. Never ride on drawbar of tractor or drawn implement.
5. When tractor is hitched to a stump or heavy load, always hitch to drawbar and never take up the slack of chain with a jerk.
6. Be extra careful when working on hillsides. Watch out for holes or ditches into which a wheel may drop and cause tractor to overturn.
7. Always keep tractor in gear when going down steep hills or grades.
8. Always drive tractor at speeds slow enough to insure safety, especially over rough ground or near ditches.
9. Reduce speed before making a turn or applying brakes. The hazard of overturning the tractor increases four times when speed is doubled.
10. Always stop power take-off before dismounting from tractor.
11. Never dismount from tractor when it is in motion. Wait until it stops.
12. Never permit persons other than the driver to ride on tractor when it is in operation.
13. Never stand between tractor and drawn implement when hitching. Use an iron hook to handle drawbar.
14. Do not put on or remove belt from belt pulley while the pulley is in motion.
15. Should motor overheat, be careful when refilling radiator.
16. Never refuel tractor while motor is running or extremely hot.
17. When tractor is attached to a power implement be sure that all power line shielding is in place.

SPECIFICATIONS

TRACTOR SERIAL NUMBER — Stamped on left side of main frame.

ENGINE NUMBER — Stamped on left side of cylinder block.

ENGINE — Number of cylinders — 4; Bore and stroke — 3-7/16" x 4-1/8"; Displacement — 153 cubic inches.

Spark plugs — (Gasoline Model) Champion J 11. (Interchangeable with J 5.) (Distillate Model) Champion J 6.

Injection System — (Diesel Model only) —

1. American Bosch type PSB Fuel Injection Pump of the constant-stroke, distributing plunger, sleeve control type, the plunger being actuated by a cam and tappet arrangement.

2. American Bosch integral governor of the mechanical-centrifugal type.

3. American Bosch pintle type nozzles and nozzle holders.

Main and connecting rod bearings — (Gasoline and Distillate) — Steel backed, babbitt lined. Precision type. (Diesel Model only) — Steel backed, copper-lead lined. Precision type.

Cylinder sleeves — Removable, alloy type, wet sleeve.

Engine lubrication — Pressure.

Ignition — (Gasoline and Distillate) — Battery through high tension coil and distributor.

(Diesel Model only) — Full Diesel type high compression ignition.

Engine speed — 1650 R.P.M. (approximate) under full load; 1810 R.P.M. no load.

Power take-off 1-3/8" diameter — 6 spline shaft — speed; 580 R.P.M. at 1650 R.P.M. engine speed.

Fuel — (Gasoline Model only) — should be a minimum of 72 octane rating. (Diesel Model only) — refer to "fuel oil" specifications on page 16. (Distillate Model only) — Grade approved by dealer.

CLUTCH AND BELT PULLEY

Clutch — single plate, dry disc (spring loaded)	9"
Pulley speed (Engine speed at 1650 R.P.M.)	1336 R.P.M.
Belt speed (with 8 1/4" pulley) (Engine Speed at 1650 R.P.M.)	2890 F.P.M.
Pulley diameter	8 1/4"
Pulley face	7 1/2"

TRANSMISSION (Standard)

4-speed forward; sliding gear type. (Based on 10-38 pneumatic tires; Engine speed — 1650 R.P.M.)	M.P.H.
1st	2.75
2nd	4.00
3rd	5.5
4th (At maximum no load engine speed 1810 R.P.M.)	12.
Reverse	3.5

ADDITIONAL SPEEDS USING CREEPER UNIT:

1st	1.65
2nd	2.4
3rd	3.3
4th	6.5
Reverse	2.1

DIFFERENTIAL — Spiral bevel.

FINAL DRIVE — One piece forged steel bull gears splined to alloy steel main axle.

WHEELS AND TREAD

Front Wheels (All Row Crop use 5.50 x 16)	7.50 x 16 or 5.50 x 16
Single Front Wheel	7.50 x 10
Rear Wheels	10.00 x 38 or 11.00 x 38
Tread Front — Standard	55-3/8" and 56-5/8"
Row Crop	7-3/4" and 11"
Wide Adjustable	55-1/4" to 82" in 2" steps for each wheel
Rear Wheels — Adjustable	56", 60", 64", 68", 72", 76", 80", 84"
Non Adjustable	58"
Wheel Base — Standard	81-3/4"
Row Crop	84-3/4"
Single Front Wheel	87-1/4"

CAPACITIES

	IMPERIAL	U.S.
Steering gear	2½ pints	3 pints
Engine crankcase	4 quarts	5 quarts
Pulley housing	1¾ gallons	2 gallons
Transmission and differential	4¼ gallons	5 gallons
Cooling system	3 gallons	3½ gallons
Fuel tank	12½ gallons	15 gallons
Oil cup in air cleaner	1¾ pints	1½ pints
Live power take-off	8½ pints	1-2/5 gallons

GENERAL DIMENSIONS (Approximate)

Length overall — (with pneumatic tires)	
Standard Model	124"
Row Crop Model	127"
Width overall — (minimum tread)	75"
Height overall — (to top of steering wheel)	69"
Drawbar — (Vertical adjustments above ground)	10½", 13", 16½", 19¾"
(Lateral adjustments, on each side of central position)	11½"

INSTRUMENT PANEL AND CONTROLS

(All Models)

PLATES No. C-260-51 and C-261-51

AMMETER — as indicated by arrow (1).

BRAKE PEDALS AND INTERLOCKING PIN — as indicated by arrow (2).

The brake pedals should be used to stop the tractor, hold the tractor in a stationary position, and to assist in making sharp turns as outlined below:

- (1) To stop the tractor, the pedals should be locked together so both brakes will operate simultaneously.
- (2) To hold the tractor in a stationary position, lock the pedals together, depress and lock them in the depressed position using the brake pedal lock.
- (3) To assist in making a sharp turn, the pedals must be operated individually, depressing the pedal on the side toward which the turn is to be made.

CAUTION — Always lock pedals together by means of the sliding pin, when travelling on the road in fourth speed.

BRAKE PEDAL LOCK — as indicated by arrow (3).

Locks the pedals down and thus prevents the tractor from moving.

CLUTCH PEDAL — as indicated by arrow (4).

When depressed all the way this pedal disengages the transmission from the engine. **CAUTION** — Do NOT operate tractor with foot resting on clutch pedal.

GEAR SHIFT LEVER — As indicated by arrow (5) is of the automotive type.

HEAT INDICATOR — As indicated by arrow (6) indicates the temperature of the liquid in the cooling system.

CAUTION — Do not operate the tractor with the cooling liquid boiling. Operation of the tractor at this temperature will result in damage to the engine.

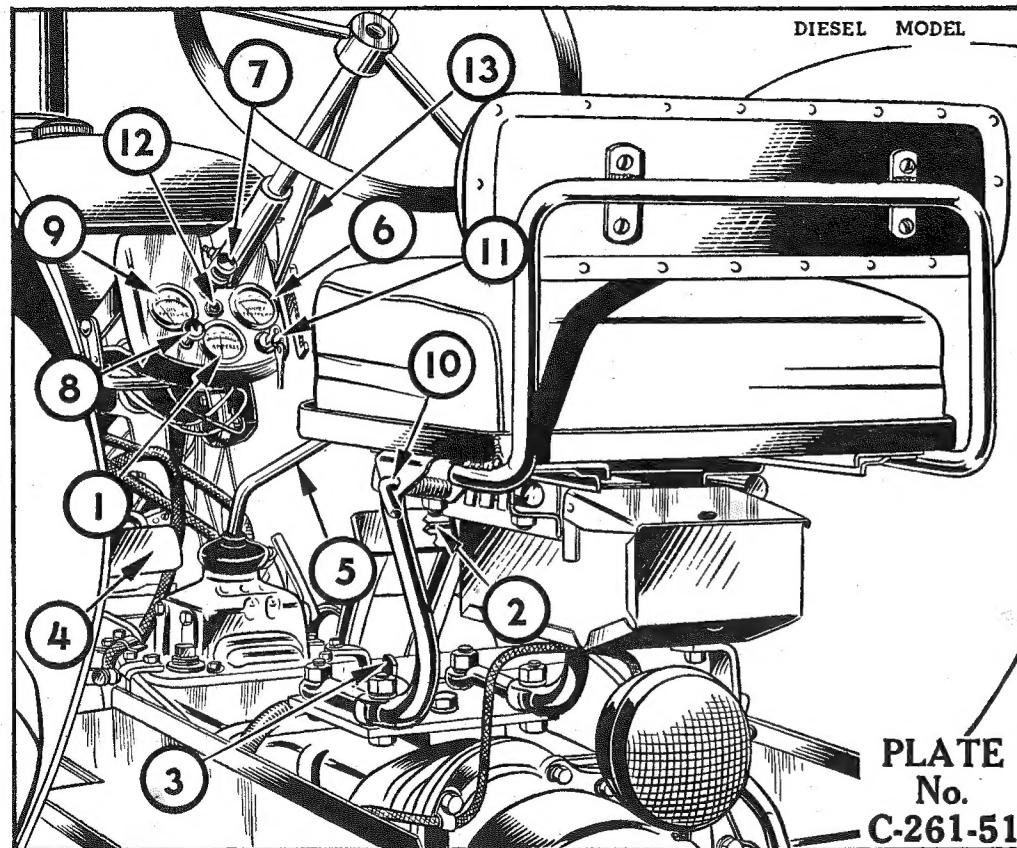
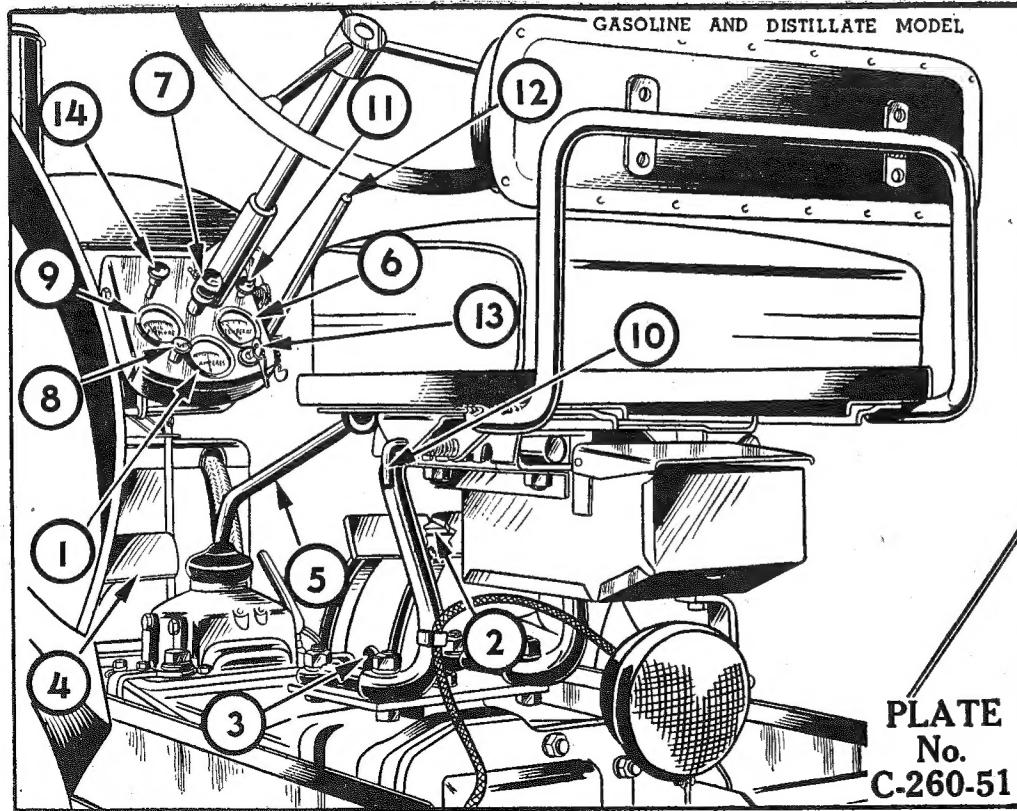
INSTRUMENT PANEL LIGHT — as indicated by arrow (7).

LIGHT SWITCH — as indicated by arrow (8).

L.P.T.O. CLUTCH LEVER — When lever is down the L.P.T.O. clutch is disengaged. To engage L.P.T.O. clutch, pull lever up all the way. **CAUTION** — DO NOT hold the lever part way up to start a machine — Pull the lever all the way up to avoid excessive clutch plate heating and wear, as this is an over centre type clutch.

OIL GAUGE — as indicated by arrow (9).

This shows the pressure in the oil lines leading from the pump to the engine bearings and should be checked every time the engine is started. Pressure should be between 20 to 25 pounds. If not between these pressures check the oil level, and if below the "low" mark, check for leaks in the oil lines to the filter and gauge. If there are none, a qualified mechanic should be consulted and the engine should not be run until corrected.



SEAT ADJUSTMENT — Seat may be moved forward or backward by releasing the seat lock, indicated by arrow (10).

INSTRUMENT PANEL AND CONTROLS

(Gasoline and Distillate)

PLATE No. C-260-51

CHOKE LEVER — as indicated by arrow (11).

This control near the lower center of the instrument panel is held in the open position by spring pressure and should be used only when starting. The spring loaded feature prevents undue choking and unnecessary engine wear and excessive fuel consumption.

ENGINE SPEED CONTROL LEVER — as indicated by arrow (12).

Through the governor this lever, when adjusted to the desired speed, keeps the engine speed uniform under varying load conditions.

IGNITION SWITCH — as indicated by arrow (13).

Duplicate keys are provided and should be removed to prevent loss, theft or tampering with the tractor by unauthorized persons. Turn to right when ready to start the engine — to the left or upright position to stop the engine.

STARTER SWITCH — as indicated by arrow (14).

This is pushed to start the engine. CAUTION — ALWAYS have gear shift in neutral position when starting.

INSTRUMENT PANEL AND CONTROLS

(Diesel Models)

PLATE No. C-261-51

HEATER SWITCH CONTROL — as indicated by arrow (1), plate C-263.

For cold weather starting this switch should be pushed in and held for 30 to 45 seconds, then released an instant before pressing the starter button. Depending on the temperature conditions and the strength of the batteries it will require 30 to 45 seconds to heat up the coil in the pre-heater box, as indicated by arrow (1), plate C-262, which is built into the manifold.

STARTER SAFETY SWITCH — as indicated by arrow (11).

Installed to prevent accidental or unauthorized starting of motor.

STARTER PUSH BUTTON — as indicated by arrow (12).

A slight pressure on this button immediately starts the engine turning over. CAUTION — ALWAYS have gear shift in neutral position before touching starter button.

STOP CONTROL AND THROTTLE LEVER — as indicated by arrow (13).

This control lever when moved to the top position of its travel moves the fuel control rack to the closed position to stop the engine. On the lower portion of the arc this lever, through the governor linkage, keeps the engine running at the desired speed under varying load conditions.

STARTING AND OPERATING DISTILLATE TRACTOR

NOTE: If tractor has been in storage (or inhibited for export) see "Starting Engines That Have Been In Storage".

RADIATOR SHUTTER

Tractors designed for operation on distillate are equipped with a radiator shutter to assist in warming up a cold engine quickly and to maintain engine at the most efficient operating temperature.

FUEL SYSTEM

The tractor has two fuel tanks, an auxiliary tank for gasoline (gasoline is used only for starting and warming up the engine) and a main fuel tank for distillate.

Be sure the shut-off valve for the main fuel tank is closed (this shut-off valve should not be opened until the engine is thoroughly warmed up) before filling tank with distillate fuel. Note: Distillate fuels should conform to your dealer specifications. Fill the auxiliary tank with gasoline and open the gasoline shut-off valve. Note: Do not have the shut-off valve under the auxiliary gasoline tank and the main distillate tank open at the same time as this will permit the distillate to mix with the gasoline, making the engine hard to start.

STARTING THE DISTILLATE ENGINE

With the distillate shut-off valve closed, drain the carburetor bowl and open the gasoline shut-off valve. Place the gear shift lever in the neutral position and advance the governor control about one-third. Pull choke rod out. Disengage the clutch, by pressing down on the clutch pedal, and push in the starter button. As soon as the engine starts, the choke should be adjusted to a point where the engine runs without missing, and as the engine warms up the choke should gradually be pushed all the way in. When the engine has run awhile and the heat indicator begins to show a temperature of 195°F. to 200°F., adjust the shutter to maintain this temperature and switch over to distillate fuel.

STARTING AND OPERATING GASOLINE TRACTOR

NOTE: If tractor has been in storage (or inhibited for export) see "Starting Engines That Have Been In Storage".

Follow the same procedure as for distillate except that the gasoline tractor is not equipped with a radiator shutter or an auxiliary fuel tank.

STARTING ENGINES THAT HAVE BEEN IN STORAGE

(Gasoline and Distillate Models)

- (1) Remove valve housing cover and flush valves and valve operating mechanism with a mixture of one-half gasoline and one-half light lubricating oil.
- (2) Remove spark plugs and pour two tablespoonfuls of the same mixture into each cylinder.
- (3) Crank engine rapidly until excess oil has been blown out of spark plug holes. This will also loosen tight piston rings and wash gummy oil from valves and pistons.
- (4) Drain crankcase, flush out with kerosene and fill with lubricating oil as specified in "Lubrication Chart".
- (5) Check oil filter to see if the new element is installed.
- (6) Remove plugs from breather pipe and exhaust pipe.
- (7) After cleaning and setting gaps instill the spark plugs.
- (8) Close all THREE drain cocks in the cooling system and fill with clean water.
- (9) Fill fuel tank.
- (10) Clean air cleaner and refill the oil cup.

(11) Install a fully charged battery, making sure connections are cleaned, lightly greased and tight.

(12) Start the engine and let it operate slowly; check for sticking valves. If any, pour a little kerosene on valve stem.

(13) Replace valve housing cover.

CAUTION — Do not accelerate engine rapidly or operate at a high speed immediately after starting it.

BASIC PRINCIPLE OF THE DIESEL ENGINE

Mechanically, the Diesel engine is like the Gasoline engine. So alike are the engines that from the standpoint of external appearance most people are unable to tell the difference between a Diesel and a Gasoline engine without looking for the telltale injection pump. Both burn mixtures of liquid fuel and air inside their cylinders, the rapid combustion of these mixtures being the source of the high gas pressures which act on the tops of the pistons to drive them downward, thereby turning the crankshaft through the connecting rods. The main difference between the two types of engines lies in the handling of the fuel.

In the Gasoline engine, the fuel and air are mixed before they enter the cylinder. In the Diesel engine, the fuel and air are mixed inside the cylinder. This is to say that the Gasoline engine draws into its cylinder a pre-formed mixture of fuel and air created by the carburetor, whereas the Diesel engine, which has no carburetor, draws into its cylinders only fresh air, the fuel being injected later. The distinction is important and the function of the fuel injection system is apparent.

In the Diesel, ignition of the fuel is caused solely by the heat developed by the compression of the air in the cylinder. This compression is very great in the Diesel; the air is so hot when the fuel spray enters that no electric spark is required to ignite it instantly. Essentially the Diesel engine is a high-compression internal combustion engine.

Control of the speed and power of a Diesel engine is by variation of the amount of fuel injected into the cylinder. There is no control of air. Control of the speed and power of a Gasoline engine is by variation of the amount of mixture (both fuel and air) admitted to the cylinder; the intake is throttled in varying degree to admit more or less as desired. The Diesel on the other hand has no throttle, in the strict sense of that word; it has only a fuel control, which in most cases is actuated through a speed governor rather than directly by the operator.

THE FUEL INJECTION SYSTEM

From the foregoing it can be realized that the fuel injection system of a Diesel engine is of paramount importance in the functioning of that type of engine. There is no carburetion system and there is no ignition system; the injection system takes the place of both in one way or other. It draws the fuel from the supply tank, forces it through filters, places it under the high-pressure required for mechanical atomization, meters it with great accuracy, distributes it in the proper sequence to the various cylinders, commences the individual injections with fine precision in timing, and produces uniformly through the nozzles that pattern of spray which the engine builder selected

as best for his particular design of combustion chamber. It does all these things well and reliably, as a rule, with very little attention.

There should be no tampering with the injection pump assembly, or removal of it for inspection, unless engine operation is seriously impaired and the cause of the difficulty is directly traceable to the pump unit. It should be borne in mind that very minor troubles, such as suction leaks at joints in the supply line to the transfer pump, can cause erratic engine behaviour. It is unlikely that the injection pump itself would require overhaul before it has seen several thousand hours of operation. This is equivalent to five years of normal usage in popular applications such as farm tractors. Even after that length of service there is no need to remove and inspect the injection pump unless loss of engine performance can reasonably be attributed to it, for pump life can be much greater, especially when fuel filtration has been excellent.

The single plunger PSB pump is a self-contained unit and requires no periodic lubrication check because lubrication is provided from the engine lube oil system; strict adherence to manufacturer's specifications regarding engine oil change and maintenance of engine oil filters is therefore of special importance. A small lube oil filter is provided with the pump itself but solely for the protection of the lower lapped section of the plunger. This little filter requires no servicing unless the entire pump is to be subjected to a major overhaul and should otherwise not be disturbed. Removal of the filter without completely dismantling the injection pump would invariably prove harmful because any deposits around the filter could be dislodged and trapped in the lubrication oil passage.

Difficulties with the fuel supply system, often laid to the supply pump, may sometimes be traced to such causes as clogged fuel filters or air leaks into the fuel lines as a result of loose connections at the various line fittings. Dented, badly crimped or spongy supply lines cause high fuel flow restrictions. Defective overflow valves may also contribute to impaired engine operation.

The SGB type fuel supply pump used with PSB pumps can be checked for proper operational efficiency by inserting a gauge in the fuel inlet line to the injection pump sump. The supply pump must be capable of producing a minimum gauge reading of 5 p.s.i. with the engine running.

NOZZLE HOLDER AND NOZZLE ASSEMBLIES

Nozzle holder and nozzle assemblies are positioned in the cylinder head of a Diesel engine, one per cylinder, very much as spark plugs are positioned in a gasoline engine. The function of these assemblies is to receive the metered quantity of fuel from the injection pump, atomize it mechanically, and direct it into the engine combustion chamber in a definite spray pattern and in such a manner as to produce the most efficient engine performance.

The indiscriminate removal of nozzle and holder assemblies is highly inadvisable for a number of reasons. Needless to say, even at this time the servicing should be performed by competent personnel.

STARTING AND OPERATING DIESEL TRACTOR

NOTE: If tractor has been in storage (or inhibited for export) see "Preparing New Engine for Operation", page 15.

1. If weather is cold, depress the air heater switch, as indicated by arrow (1), plate C-263, for 45 seconds.

2. On releasing the air heater switch, open the throttle control one third and depress the starter push button. (Do not allow the engine to turn over for more than 10 seconds at a time with the electric starter. Allow about 90 seconds between each cranking.)
3. As soon as the engine starts, release the starter button and note the lubricating oil pressure gauge. It should register pressure within 30 seconds.
4. If the oil pressure does not come up, stop the engine and check the lubrication system for oil pressure failure. The oil pressure for this engine, operating at normal temperature, will be between 15 and 25 lbs. On a cool engine this pressure may go as high as 50 lbs. or more, but will return to the normal when operating temperature is reached.
5. If operating temperature is below freezing, it is desirable to run the engine at partial speed until the water temperature rises to 120°F. After the engine has operated at no load for approximately 15 minutes, the engine will be ready to operate at full throttle.
6. Check the battery-charging ammeter. Because the voltage regulator controls the rate of charge, it is common for the reading to be at zero or close thereto. This indicates that the battery is fully charged or in a high state of charge. If the reading continues at a high figure (over 10) this indicates trouble in the voltage regulator. However, a run-down battery will take a high rate of charge for a few hours. If the reading shows high on discharge, there is a short somewhere between the ammeter and the generator.

STOPPING ENGINE

(Diesel Models)

1. After the load has been disengaged from the engine, slow down the engine to idling position of the throttle.
2. Allow the engine to idle a few minutes before stopping. Too rapid cooling may warp the valves or even crack the manifold.
3. After allowing the engine to idle a few minutes for reasons given, move throttle to stop position.

PREPARING NEW ENGINE FOR OPERATION

(Diesel Model)

1. Make a careful overall inspection. Look for broken or loose electrical and hose connections, loose bolts and capscrews. Report any damage or shortages to the transportation agent.
2. Remove any tape that may have been used to seal the exhaust and air cleaner intake.
3. See that the air cleaner clamp is tight so that no dirt can be sucked into the air intake.
4. Check the fins and passages between the tubes of the radiator to be sure that they are free from any dirt or foreign matter that might restrict the flow of air between the radiator tubes.
5. If the drain plugs have been removed and wired to the engine, reinstall the drain plugs, one at end of block; the other in the water pump.
6. Drain the oil pan of the rust-preventive, and reinstall the drain plug.
7. Fill the oil sump with oil of the recommended viscosity for the prevailing temperature, up to the full level mark.
8. Fill the oil cups of the generator and starter. Do not over-lubricate.
9. Crank the engine by hand two or more revolutions. This is a check to see that it will turn freely.

10. Fill the cooling system with clean, soft water, or the proper anti-freeze mixture. Check the hose connections for leakage. Check the storage battery and connect it to the electrical system.
11. Fill the fuel tank with Diesel fuel.
12. Vent the primary filter, as indicated by arrow (2), plate C-262, which is filled by gravity flow from tank, until all air has been forced out by fuel.
13. Remove vent screw in secondary filter, as indicated by arrow (2), plate C-263, and turn engine over with starter until fuel flows free of foam or air bubbles. Replace vent screw.
14. The high pressure system is self ventilating due to the fact that any air trapped by the Injection Pump Plungers is forced out through the injectors into the combustion chamber. The fuel throttle control must be in the full load position when turning the motor over to purge the system.

FUEL OIL INFORMATION

(Diesel Model Only)

FUEL OIL SPECIFICATIONS:

- Fuel used in a Diesel Engine must have certain qualities in order to ignite and burn at proper temperatures, and at the proper rate. Experience has proven that the fuel best suited to the Buda Diesel Engine, closely follows these specifications:

Gravity A.P.I.—30-35.
Viscosity Saybolt Universal at 100°F. 35-40.
Flash F° MINIMUM — 150°F.
Diesel Index — 48.5 to 65.5.
Cetane Number — 46-60.

POUR — 0°F.
98% Recovery — 700°F.
Sediment and Water — Trace.
ASH — Maximum — .02.
Conradson Carbon, Maximum — .03.
Sulphur, Maximum — .5.

If a fuel has a high flash and fire point, it will be necessary to have a high temperature in the combustion chamber, which may tend to make the engine hard starting, especially in cold weather. When the fuel has a very low flash and fire point, there is danger of it burning before the piston is in the proper firing position, which will cause detonation and loss of power.

It is also very necessary that the fuel have lubricating value, as that is the only way the plungers in the fuel injection pump and fuel nozzles are lubricated.

If the occasion arises when it is impossible to procure fuel with the proper lubricating value, add one quart of S.A.E. 10 oil to every 10 gallons of fuel. Distillates should be used **only** in emergencies and the entire fuel system should be drained and cleaned before using regular Diesel fuel again.

FUEL HANDLING

NO FUEL IS SATISFACTORY FOR USE IF IT IS DIRTY. When you consider that the plungers in the fuel injection pump have less than .0001" clearances you can readily see the damage that will be caused, by a very few minute particles of dirt, to this piece of precision made equipment.

Foreign material most commonly found in fuels can be divided into two classes:

1. Physical dirt such as rust, scale, silica, or road dust may be carried in suspension in the fuel. Damage to injection equipment from this type of foreign material will occur when the pump is in operation. Damage to the superfinished surfaces of the precision made injection equipment may be so minute that it will not be visible to the naked eye, but will be clearly visible when the surface is viewed under a microscope.

2. Chemically compounded foreign material such as rust, due to water suspended in the fuel. Damage due to this type of foreign material will occur during the engine shut down period, when tiny rust spots form on the highly polished surfaces of the plungers and barrels.

The most efficient filter system will not remove water that is suspended in the fuel, nor will it remove minute particles of rust, scale, etc., completely. It is therefore very important that CLEAN fuel be purchased, and by proper handling and storing methods that it be kept CLEAN.

The following suggestions will assist you in your fuel handling problems:

1. Fuel should be stored in black iron storage tanks.
2. Fuel should be removed by a suction pump and hose arrangement.
3. The lower end of the suction tube should be 3" to 4" above the bottom of the tank.
4. Sediment and water should be drained from the bottom of the tank regularly.
5. Fuel storage tanks should be kept as full as practical and located in a spot where temperature changes are at a minimum in order to avoid "breathing" which causes condensation and therefore water in your fuel tank.
6. Fuel should never be stored in moveable tanks that may be transported to the field, UNLESS they are allowed to stand for 24 hours before fuel is withdrawn for use.
7. Fuel should not be removed from storage tanks within 24 hours of filling. This will allow suspended dirt to settle.
8. Fuel handling equipment such as funnels, strainers, or measures, if used, must be meticulously clean.
9. Fuel should not be handled in open containers, especially where there is dust and dirt blowing around.
10. NEVER use "waste" or "linty" rags around fuel containers or fuel injection equipment.
11. The fuel tank on the tractor should always be filled at the END of the day's work to minimize condensation of the moisture in the air space above the fuel.

The fuel injection equipment on our Diesel Tractor will give trouble-free service if CLEAN FUEL is used and lubrication and maintenance procedures are followed.

Diesel fuel injection equipment repair or replacement is of necessity an expensive proposition and an entire season's fuel saving accomplished by your Diesel engine may be lost by not observing the preceding precautions for proper fuel handling.

FUEL FILTERS

As outlined in the preceding paragraphs the first step in assurance of obtaining trouble-free operation of your fuel injection equipment is obtaining clean fuel and keeping it as clean as possible.

The second and equally important step in assuring trouble-free operation of your injection equipment is proper maintenance of filters. Diesel engine operators must keep this in mind at all times.

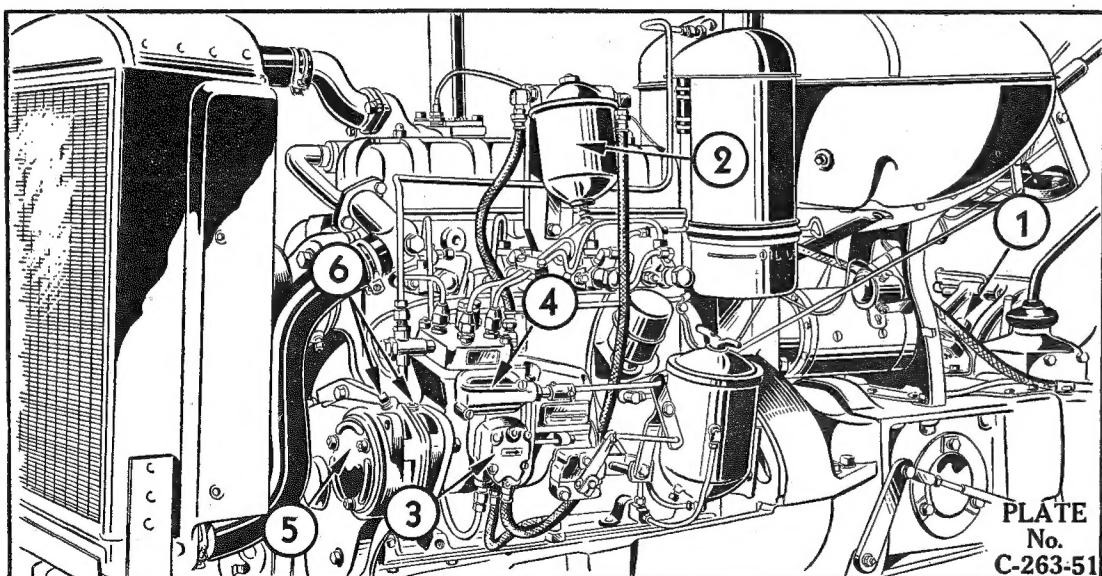
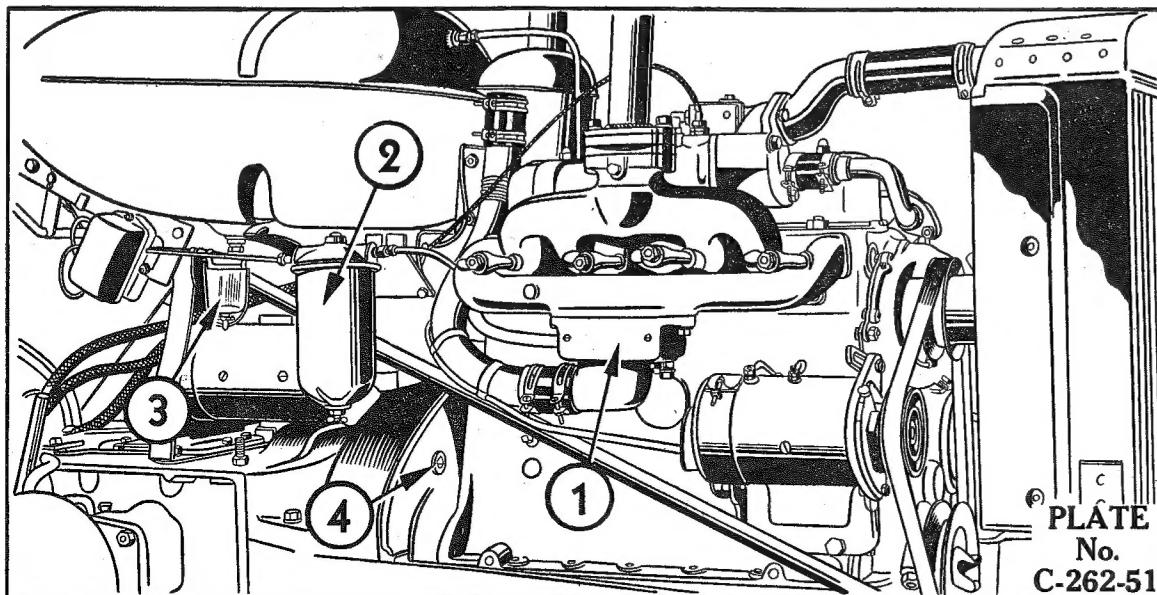
This is particularly important for Diesel farm tractor operators, especially when operating under dusty field conditions, where it is almost impossible to keep the fuel completely free of this dust.

There are two (2) fuel filters used on our Diesel tractor as well as a sediment bowl. The fuel flows from the tank through the sediment bowl which is mounted under the tank as indicated by arrow (3), plate C-262. This sediment bowl should be removed and cleaned before the tractor is started each morning. In this way most of the water and sediment which has settled out of the tank full of fuel will be eliminated from the system before it reaches the primary filter as indicated by arrow (2), plate C-262.

The primary filter is of the replaceable element type. It is designed with a drain cock in the bottom so that it may be drained. A small amount should be drained each morning before the tractor is started. In this way any water which has reached the primary filter will be eliminated from the primary system.

The fuel is then pumped through the transfer pump as indicated by arrow (3), plate C-263, and through the secondary filter as indicated by arrow (2), plate C-263, to the injection pump sump.

The secondary filter is also of the replaceable element type and designed with a drain cock in the bottom of the bowl. If any signs of water are found when the primary filter is checked, then the secondary filter should also have a small amount of fuel drained out to check for water carry over. Check at least once every 10 days or oftener.



SERVICING INJECTION NOZZLE ASSEMBLIES

We recommend that nozzle assemblies be removed from the engine, cleaned and checked every 500 hours. This period can be varied depending upon the quality of the fuel used. If nozzles are regularly and carefully cleaned and tested they will give many hours of satisfactory service, but if they are neglected the pintle may stick and then the pintle and seat will require replacement. It is sometimes possible to salvage a stuck pintle, but this should be attempted only by competent and experienced mechanics.

A faulty nozzle can be located by loosening the high-pressure line fitting on each nozzle holder in turn, thereby allowing fuel to escape at the union rather than enter the cylinder. The cylinder whose cut-out in this manner least affects engine performance is usually the one with the faulty nozzle.

Before loosening any lines, apply kerosene or fuel oil freely to all connections, in order that dirt and grease may be removed.

Detach high-pressure tubing and leak-off lines, covering their open ends with cloth or paper caps to protect against the entrance of dirt.

Remove the holding nuts and pull assembly from the engine, being careful not to strike the end of the nozzle against any hard surface. If the assembly seems to be stuck, rotate slightly to break it loose from carbon deposits within the cylinder recess.

Wipe all dirt and loose carbon from the assembly with a clean cloth, free of lint.

Clamp the nozzle holder assembly in a vise and remove the nut holding the pintle and seat to the holder, then lift off the pintle and seat.

Normally the pintle can be withdrawn from the seat easily; however, in some cases it may be necessary to soak the tip in fuel oil, acetone, carbon-tetrachloride or similar carbon solvent before removal is possible. Be very careful with the lapped surface of the pintle. Do not touch it with the fingers unless it is under fuel oil.

The pintle can be cleaned with mutton tallow on a soft cloth or felt pad. The pintle may be held by its stem in a revolving chuck during this operation. An orange stick or a soft brass wire brush will be helpful in removing carbon from the pintle. After cleaning the pintle, wash carefully in fuel oil.

Test the cleaning job by observing to see if the pintle will settle to its seat without sticking. Shake off all excess fuel oil, hold the seat with the lapped end up, lift the pintle about half way out and release. The pintle should settle to the bottom smoothly and easily.

The orifice of the nozzle seat can be cleaned by a sharpened orange stick revolving in a drill chuck. The valve seat can also be cleaned at the same time, with the same stick and in the same manner.

Chuck the pintle again, dip the seat in fuel oil and slip in place on the pintle. Start the drill and work the seat off and on the pintle to polish the lapped surface. Slide the seat all the way on the pintle and apply some pressure so the seats will be cleaned. This cleaning operation must be carefully done and may take some time to get a good job. Wash thoroughly and reassemble on the holder.

Attach the assembly to a nozzle tester and before tightening the adaptor nut, work the handle slowly until oil drips from the connection, then tighten the connection. With the gauge valve closed, pump the handle fast several times to force large quantities of fuel oil through the nozzle. Next operate the tester handle slowly and observe the spray pattern. There should be two parts to this spray pattern — a heavy center section in the shape of a long slender cone in line with the nozzle (not off to one side)

and a lighter mist around it. The pintle should chatter and there should be no drip from the end at pressures up to the opening point. Leak off should be very little — in fact while testing there is usually no leak off. If there is a large leak off it means that the pintle body is worn allowing fuel to escape that way instead of going out into the engine cylinder. Worn pintles will cause engine to miss at low speed. Solid fuel emerging from a nozzle indicates either dirt on the seat or a damaged seat. If available, a strong magnifying glass is useful to examine the seat. If the seat has not been damaged it can be made to operate properly if the cleaning job is carefully done.

After appropriate reconditioning of the nozzle holder and nozzle assembly has been accomplished by competent personnel, thoroughly clean the nozzle recess in the cylinder head before inserting the nozzle holder assembly. Particular attention should be paid to the seating surfaces, in order that no small particles of carbon may bind the assembly upon reinstallation or permit blow-by of combustion gases. If the seating surface is not clean and smooth, leakage of hot gas will overheat the nozzle quickly and seriously. No hard or sharp tools should be used for the cylinder head recess cleaning operation. A round piece of wood or brass, properly shaped, is very effective, or the engine manufacturer may be contacted for a suitable special tool.

A soft copper gasket is used between the seat in the cylinder head and the nozzle cap nut. It is essential that there be no carbon flakes on these seating surfaces and a new gasket should always be used.

The nozzle and holder assembly should be carefully inserted when reinstalled. Do not allow the nozzle tip to strike the recess wall.

Secure the assembly by tightening the nuts evenly to avoid cocking.

Do not overtighten; use a wrench with handle only 6" long. DO NOT EXCEED 14 TO 16 FT. LBS. TORQUE.

Under no circumstances should the nozzle opening pressure adjustment as established by the engine manufacturer be changed.

SUMMARY

When overhaul of the injection pump is indicated by impaired engine performance which is directly traceable to the injection pump, the entire system, consisting of the pump, governor, fuel supply pump, overflow valve, nozzles and holders, should be sent to the nearest American Bosch service station for repair. An attempt to undertake dismantling or repair of injection equipment should never be made by persons not fully qualified and equipped.

Bear in mind that the cause of engine misbehavior is most likely to reside in simple difficulties with fuel supply, as for example suction leaks of air through loose tubing connections, or clogged filters, rather than with the injection pump proper or even the nozzles.

CARE AND OPERATION

Before starting a new tractor — READ YOUR INSTRUCTION BOOK

1. Lubricate the entire tractor, referring to the "Lubrication Chart" on pages 22 and 23 and check oil levels as specified on pages 21 and 24.
2. Check tire inflation referring to instructions on tires, pages 49 and 50.
3. Check cooling system referring to instructions on pages 39, 40 and 41.
4. Use correct oil — ADD ONE PINT OF ENGINE OIL TO EVERY FIVE GALLONS OF FUEL USED DURING THE FIRST 100 HOURS.
5. For a new engine, use SAE 20 above 32° F., for the first season of operation.
6. CAUTION — For the first 40 hours, work tractor to about one half capacity. Use only first and second gear to avoid overloading the engine.
7. Long life is built into this modern engine and it can best give you the service you desire by reading and following the instructions as outlined in this book.
8. Always allow an engine which has been under load to idle for a few minutes before stopping, as this allows the circulating water to cool the cylinders, valves, etc. Watch the oil level carefully, and change as recommended on page 28.
9. Service the oil filter and the air cleaner as instructed on pages 31 and 32.
10. For maximum economy use the highest transmission speed, and the lowest engine speed, which will maintain the desired speed of travel, without overloading.

LUBRICATION CHART

PLATES No. C-9-51 and D-9-51, Pages 22 and 23

KEY TO LUBRICATION CHART

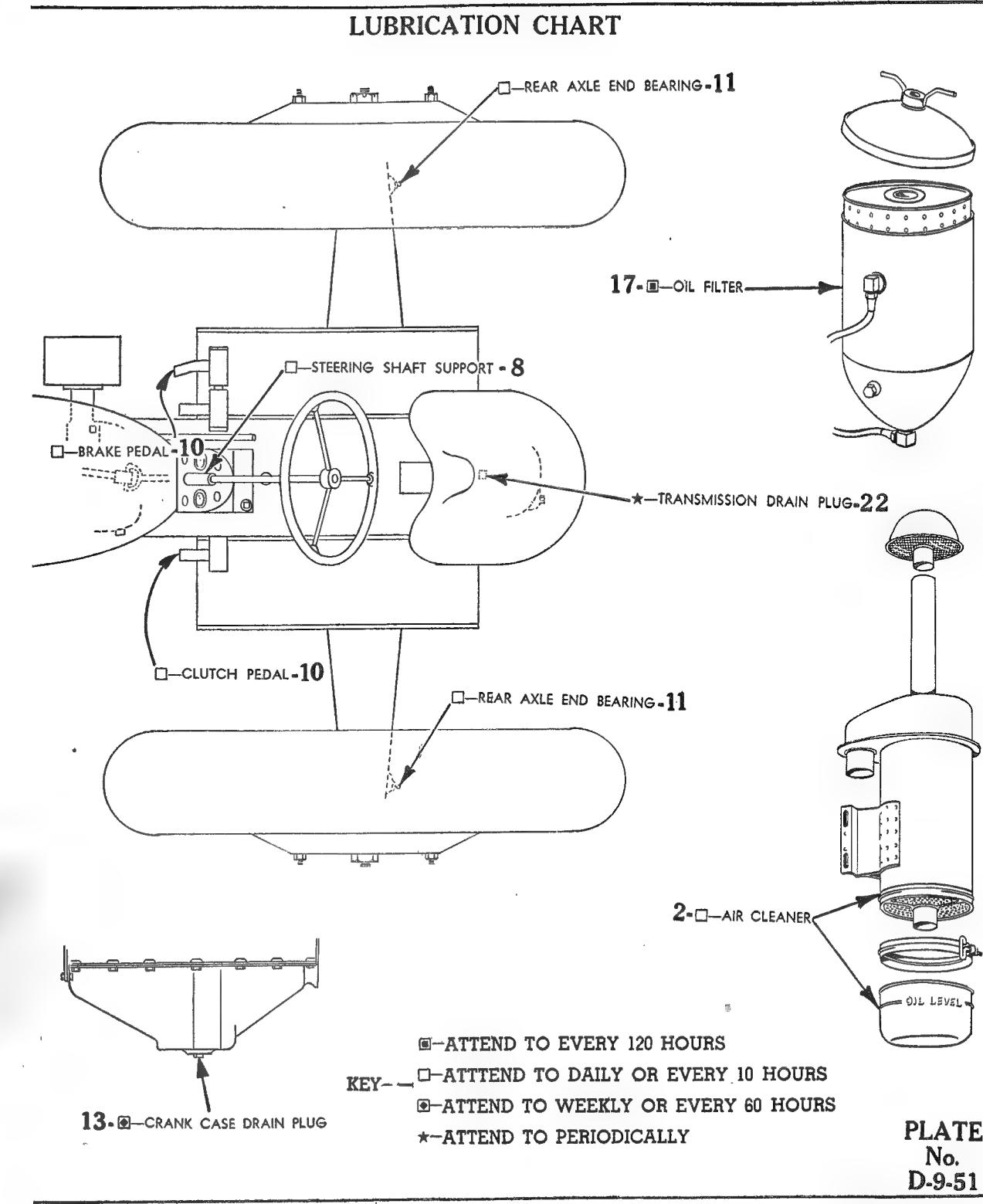
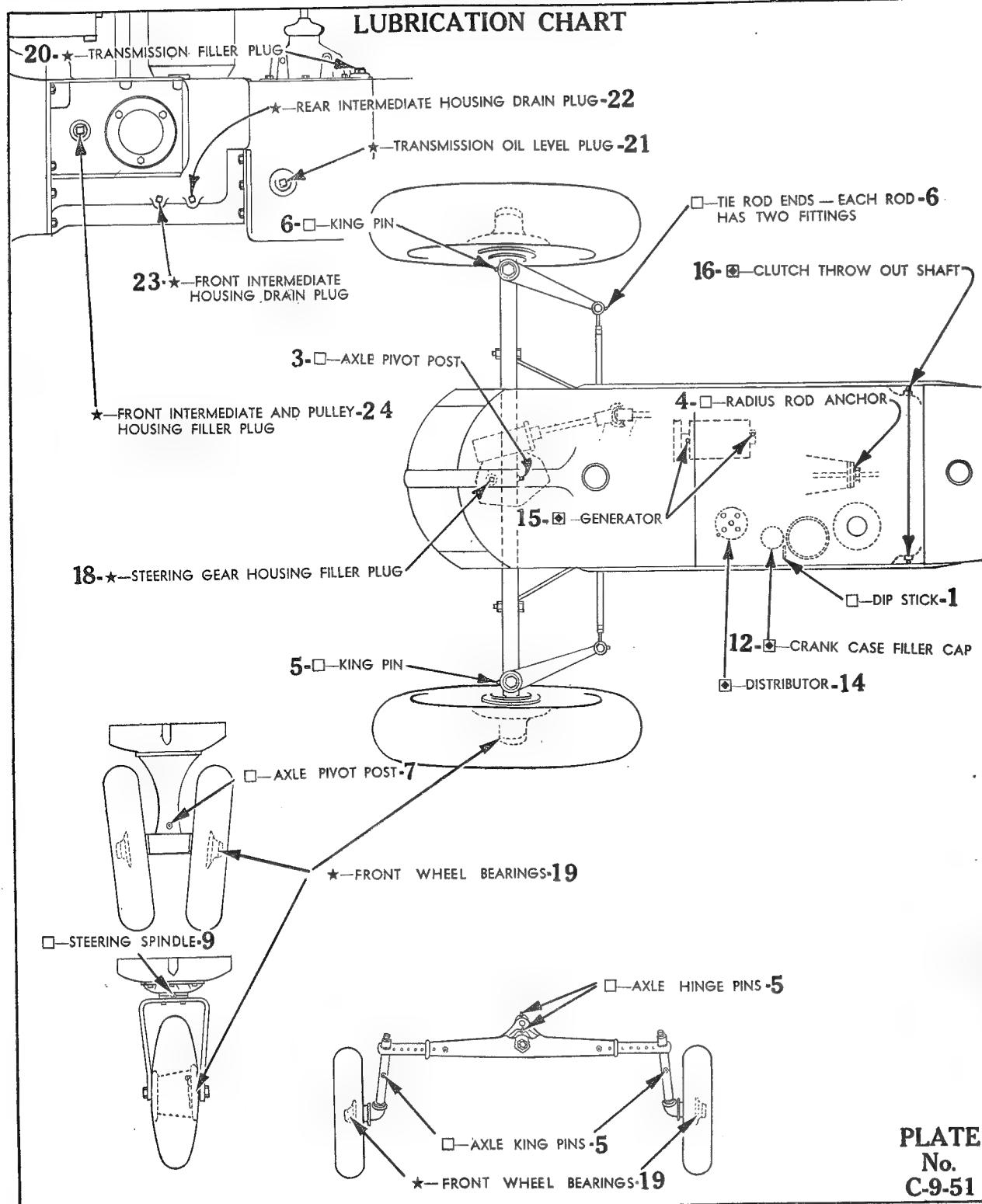
NOTE: The symbols shown by the reference numbers on the illustrations indicate the intervals of lubrication.

Specifications of lubricants referred to are given on pages 25 and 28.

DAILY OR EVERY 10 HOURS OF OPERATION

1. Dipstick	{ If oil level is at, or below, the low mark on the dipstick, add new oil until oil level is up to the full mark.
2. Air Cleaner	
3. Axle Pivot Post, Standard Model	{ Clean and refill oil cup to oil level bead with same grade oil as used in the engine crankcase. Capacity 1 1/8 Imperial pints. Refer to page 32 for additional information.
4. Radius Rod Anchor, Standard Model	
5. Axle King Pins, Axle Hinge Pins; Standard or Wide Adjustable Front Axle	
6. Tie Rod Ends, Standard or Wide Adjustable Front Axle	
7. Axle Pivot Post, Row Crop	
8. Steering Wheel Shaft Support	
9. Steering Spindle, Single Front Wheel	
10. Clutch and Brake Pedals	
11. Rear Axle Ends	

Use standard Alemite grease and put 2 or 3 shots from the grease gun into each Alemite fitting.



◆ WEEKLY OR EVERY 60 HOURS OF OPERATION

12. Filler Cap	{ Wash in gasoline, dip in engine oil, shake off excess. Clean more often under dusty conditions.
13. Crankcase Pan Oil Drain Plug	{ Drain all oil from crankcase pan. Refill with new oil to full mark on dipstick. Capacity — 4 Imperial quarts. Refer to specifications of lubricant page 28 for type of oil.
14. Distributor	Few drops of engine oil in oil cup.
15. Generator	Few drops of engine oil in oil cups.
16. Clutch Throw-out Shaft	
Starter (Diesel Model) —	Few drops of engine oil in oil cup.

□ EVERY 120 HOURS OF OPERATION

17. Oil Filter Element	{ Replace oil filter element as per instructions given on page 31.
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★ PERIODICALLY — Check once a month, replace lubricant every 1000 hours of use.

18. Steering Gear Housing —	Filler plug on top cover. Use SAE 140. Capacity 2½ Imperial pints.
19. Front Wheel Bearings.	

TRANSMISSION AND DIFFERENTIAL

20. Oil Filler Plug	{ Use approved S.A.E. 90 extreme pressure (mild) gear lubricant. Check lubricant once a month and bring level up to level plug (21). Refer to page 43 for further instructions. Capacity — 4½ Imperial gallons.
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FRONT INTERMEDIATE AND PULLEY HOUSING

23. Front Intermediate Housing Drain Plug	{ Use approved S.A.E. 90 extreme pressure (mild) gear lubricant. Check lubricant level once a month and bring level up to oil filler plug (24). Capacity — 1¾ Imperial gallons.
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LIVE POWER TAKE-OFF (Extra)

25. Oil Filler Plug	{ Use approved S.A.E. 90 extreme pressure (mild) gear lubricant. Check level once a month whether in use or not. Change oil every 1000 hours of power take-off use. Capacity 8½ Imperial pints.
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MISCELLANEOUS PARTS

{	Use a few drops of engine oil occasionally on the linkages or control rod connections such as clutch rod, brake linkages, throttle linkages, etc.
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CHASSIS LUBRICATION

At least once a year, or every 1000 hours, drain transmission compartments by removing the three plugs, 22 and 23, on the lubrication chart. Preferably the draining should be done while the tractor is warm.

The transmission will require 4½ Imperial gallons (5 U.S. gallons) to fill and the pulley housing 1¾ Imperial gallons (2 U.S. gallons). After filling the transmission do not use the creeper with the shift in the low speed (lever towards the rear) until the tractor has been operated for about one hour or so, as this chamber is filled from the transmission by splash.

If the tractor is operated at very low temperature the pulley housing and transmission lubricant may be thinned with one half gallon of kerosene, but before using in warm weather this thinned mixture MUST be drained and replaced by new oil.

QUALITY OF LUBRICANT — Use a good grade of mineral oil made by a reputable manufacturer as the best assurance of trouble-free service. SAE 90 extreme pressure (mild) transmission lubricant can be used both winter and summer.

FRONT WHEEL BEARINGS — To provide satisfactory lubrication to the front wheel bearings remove wheels, clean and repack with wheel bearing grease periodically.

PRESSURE GUN LUBRICATION — Use a good quality grease, not one that will thin out under load and moderate temperatures. Keep the grease and the gun clean — clean each fitting before use and force enough lubricant into fitting to insure a fresh supply to the wearing surfaces.

ENGINE

CONSTRUCTION — The engine is a heavy duty, 4 cylinder, valve in head, wet sleeve motor with a pressure oiling system as described in detail on pages 25 and 28.

A water pump is used with a full flow by-pass thermostat to insure constant motor temperature which is so important in securing long life from the wearing parts. All working parts are protected by the large capacity oil filter used, the heavy duty air cleaner, and the careful sealing of the main bearings at the front and rear of the crankshaft.

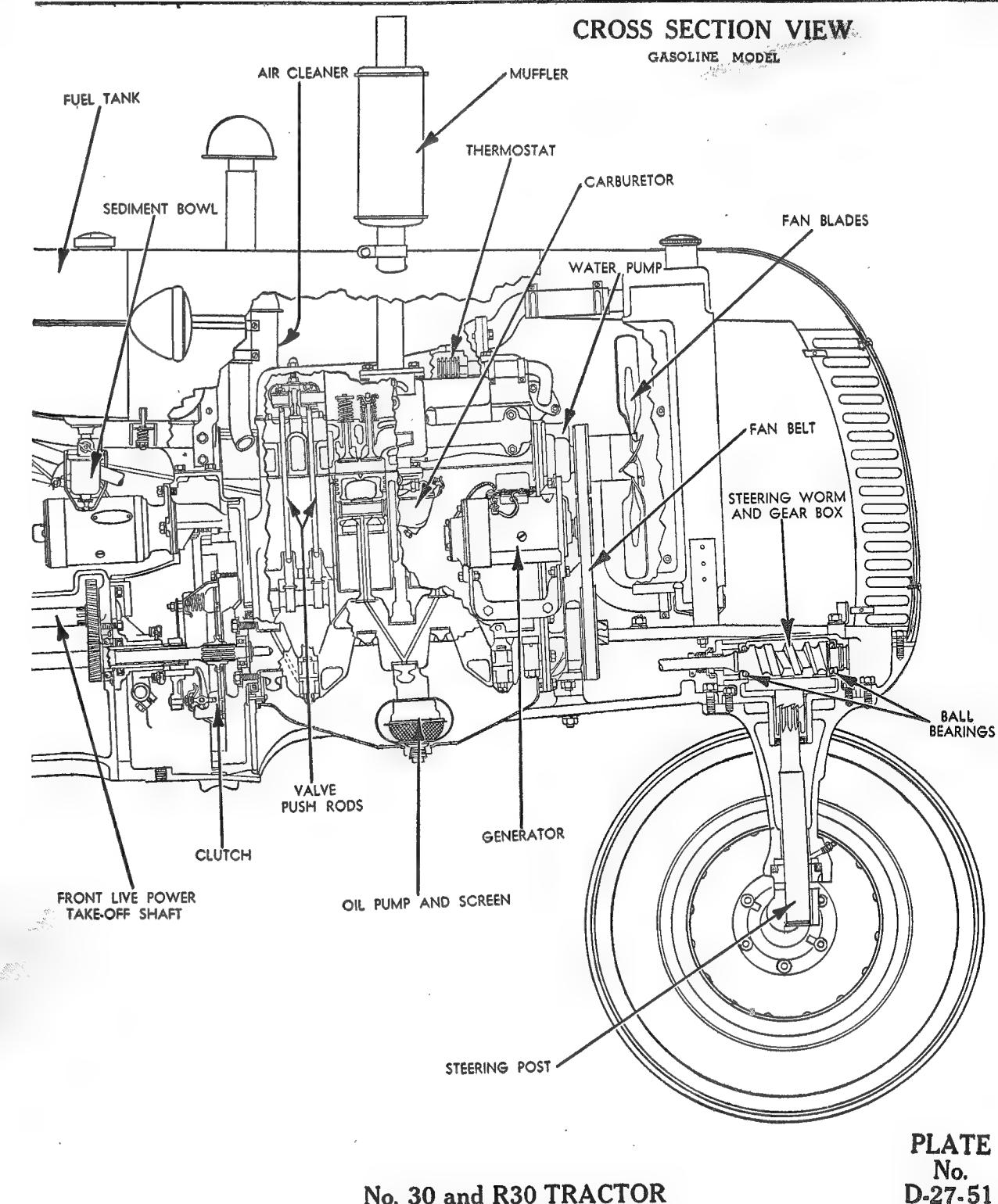
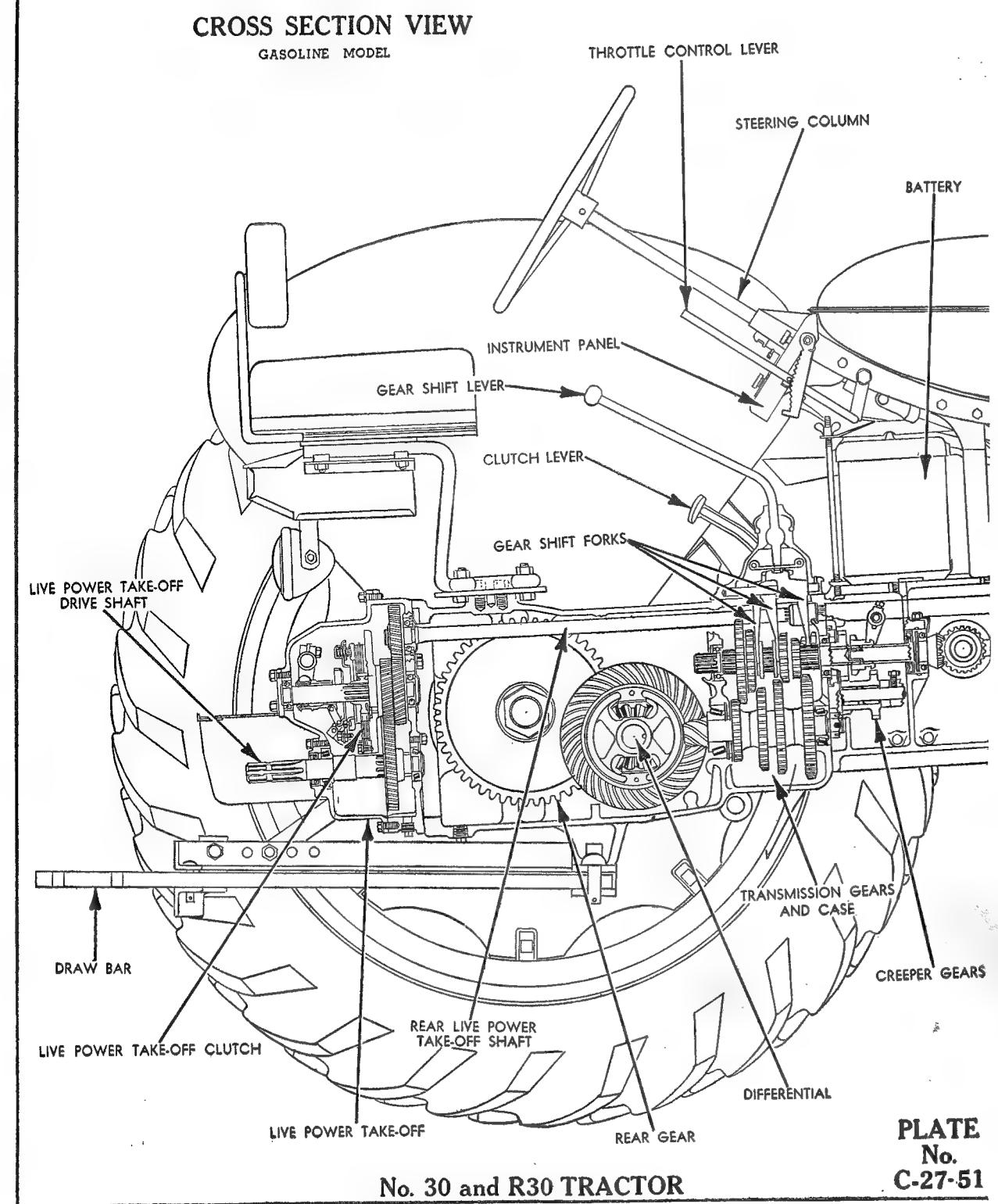
The high quality variable speed governor provides constant engine speed control. The main and connecting rod bearings are of high precision, interchangeable, steel-backed babbitt design.

SERVICE — It is strongly recommended that, should any work have to be done on the motor, it be taken to your dealer. Your dealer has the proper facilities and the trained personnel to give your tractor the efficient attention that it deserves.

ENGINE LUBRICATION

ENGINE OILING SYSTEM — Functioning as it does to provide lubrication for all the moving parts of the engine which operates under different conditions of heat and pressure, it is necessary that a good grade of engine oil be used. It is also important that the oil be kept CLEAN and in a CLOSED CLEAN CONTAINER.

DESCRIPTION — Pressure is furnished by a gear type pump which draws the oil from the crankcase through a screen. From the pump it goes through passages drilled in the block to the main and connecting rod bearings. The connecting rods are rifle drilled for wrist pin lubrication. Oil is metered to the rocker arm shaft for rocker arm lubrication and to the rocker arm valve contact faces.



The camshaft is oiled by splash and by oil draining from the head through cored passages in the block. The governor, governor shaft, and timing gears are liberally bathed in oil to prevent undue wear and to wash off accumulated sludge and moisture. Part of the oil is by-passed through the filter. (See page 31 for servicing.)

PRESSURE CONTROL — A pressure relief valve is located at the front of the oil gallery on the left side of the block and should not require attention. It is dangerous to tighten up a pressure valve to correct a drop in pressure. The oil pressure as indicated on the gauge should be from 20 to 25 pounds at full throttle and 8 to 10 pounds at idle speed.

TYPE OF OIL — Above 32° F., SAE 30 should be used, from 10° F. to 32° F. use SAE 20W, and below 10° F., use SAE 10W. Always use top quality oil.

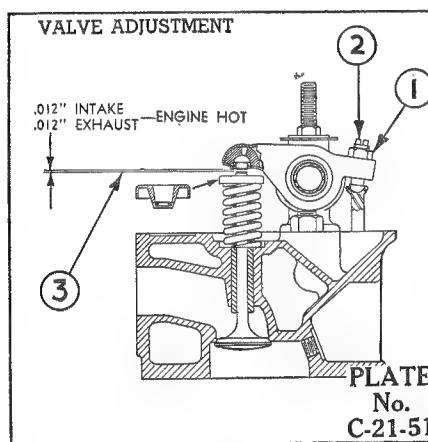
Note: Use a good grade heavy duty oil for Diesel engines.

CAUTION: For a new engine use SAE 20 above 32° F. for the first season of operation.

WHEN TO CHANGE AND ADD OIL — It is a good practice to change the oil every 60 hours and if running in cold weather the change should be made more often. The oil capacity is 4 Imperial quarts. Always look at the oil pressure gauge immediately after starting the engine. The oil level should be checked at least once a day and if at, or below, the low mark on the dipstick, oil should be added.

QUALITY OF OIL — The best insurance of good quality is to buy from a reputable manufacturer. Oils should be free from foreign substances such as soaps, resins, acids, etc., and should not corrode the engine surfaces. The newer, so-called heavy-duty oils are satisfactory but if an engine has been run on other types of oils do not add heavy-duty oil without thoroughly flushing the crankcase by an approved motor flush system. Even after this is done, the new heavy-duty oil should be changed at 10 hours, then at 25, and then at 60.

BREATHER CAP — This cap acts as a filter to clean the air which surges into and out of an engine when it is operating. To remove dust and dirt from the air drawn in the screen must be kept clean and covered with oil. It should be inspected and if dirt is present, the cap should be washed in gasoline, then dipped in engine oil, excess oil shaken off, and the cap put in place again.



VALVE TAPPET ADJUSTMENT

(All Models)

PLATE No. C-21-51

Every 400 hours or once a year, it is recommended that a competent mechanic check the tappet clearance. A clearance of .012" is necessary between end of rocker arms and valve stems when valves are closed and the engine is warm.

- (1) Before checking valve clearance, make sure ignition switch is off. This eliminates danger of accidentally starting the engine.
- (2) Remove valve cover.
- (3) Crank the engine slowly, watching No. 4 cylinder valves. When the exhaust valve is just closed and the intake valve is just starting to open, No. 1 cylinder is at top dead centre on the compression stroke — and both valves are closed.

- (4) Loosen the lock nut as indicated by arrow (1) and adjust screw as indicated by arrow (2) in rocker arm so that a .012" feeler gauge as indicated by arrow (3) slips snugly between end of rocker arm and the valve stem.
- (5) Tighten lock nut and recheck clearance. Check both intake and exhaust valves on cylinder.
- (6) Crank engine $\frac{1}{2}$ revolution at a time and check clearance of each cylinder's valves and adjust as instructed above. Do this on each set of cylinder valves in succession according to the firing order of the engine, which is 1, 3, 4, 2, as shown on Plate No. C-20 on page 35.
- (7) Replace valve cover. Check to make sure the valve cover gasket makes an oil-tight seal with the cylinder head. Replace the gasket, if necessary, with a new one.

ZENITH CARBURETOR

(Distillate Model)

PLATE No. C-104-49

Functioning as it does to provide an efficient fuel mixture over wide ranges of load and speed, and having to take in fuel which may have impurities in it, it is reasonable that a little attention be paid to the carburetor.

- (1) **ADJUSTMENT** — High Speed Jet, as indicated by arrow (1). Open throttle approximately $\frac{1}{4}$ open, turn the main jet adjustment clockwise until the fuel flow is shut off and speed of engine drops because of lean mixture, then open until engine runs smoothly. Readjust after engine is under load.
- (2) **Idle Adjustment** — Close idle adjustment needle, as indicated by arrow (2), then open one turn. Start engine and run at the low idling speed (no load) until warm. Close throttle. If engine rolls, slowly turn idle adjustment in or out until the engine runs smoothly. The idling speed is set by the throttle stop screw, as indicated by arrow (3).
- (3) **Float Level** — With throttle body and bowl cover assembly inverted, the distance from the gasket surface to the further edge of the float is $1\frac{5}{32}$ ". To adjust bend levers midway between float valve and floats.

CLEANING OF CARBURETOR — Every 100 or 200 hours remove drain plug and drain the carburetor bowl.

ZENITH
CARBURETOR
(Gasoline Model)
PLATE No. C-104-49

Functioning as it does to provide an efficient fuel mixture over wide ranges of load and speed, and having to take in fuel which may have impurities in it, it is only reasonable that a little attention should be paid to the carburetor.

(1) **ADJUSTMENT**—High Speed Jet as indicated by arrow (1). This adjustment is provided to take care of different fuels and operating conditions and while a new engine requires a slightly richer mixture, the operator will soon find that the tractor performs best with the screw from 3 to $3\frac{1}{2}$ turns open. This adjustment can best be performed with the tractor at normal working temperature and under load, and after a few trials the correct position will be found. Nothing is to be gained by operating with too lean a mixture as power is lost and the engine will run warmer.

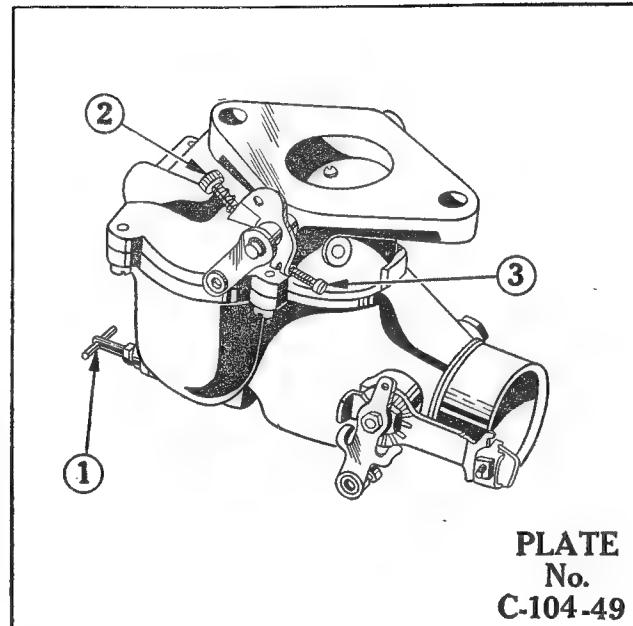


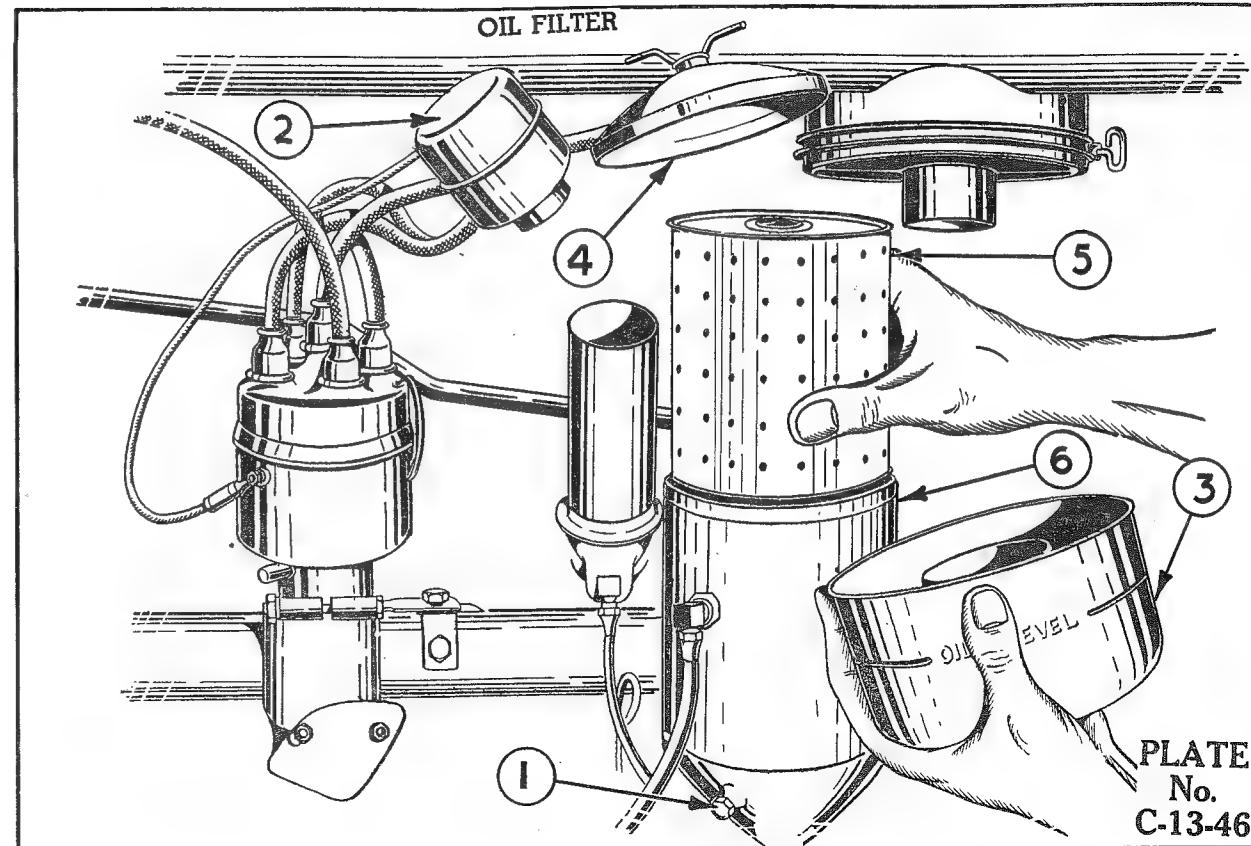
PLATE
No.
C-104-49

(2) **Idle Adjustment** — The throttle adjusting screw as indicated by arrow (3) should first be set to give a slight increase in idle speed then turn the idler adjusting screw as indicated by arrow (2) in or out to give a smooth idle. Then re-adjust the throttle adjusting screw to give the correct idle speed.

(3) **Float Level** — With throttle body and bowl cover assembly inverted, the distance from the gasket surface to further edge of float is $1\frac{5}{32}$ ". To adjust bend levers midway between float valve and floats.

CLEANING OF CARBURETOR — Every 100 to 200 hours, depending upon operating conditions, remove the drain plug, allow some gasoline to run out and then replace.

NOTE — This engine is designed to operate on gasoline having a minimum of 72 octane rating.



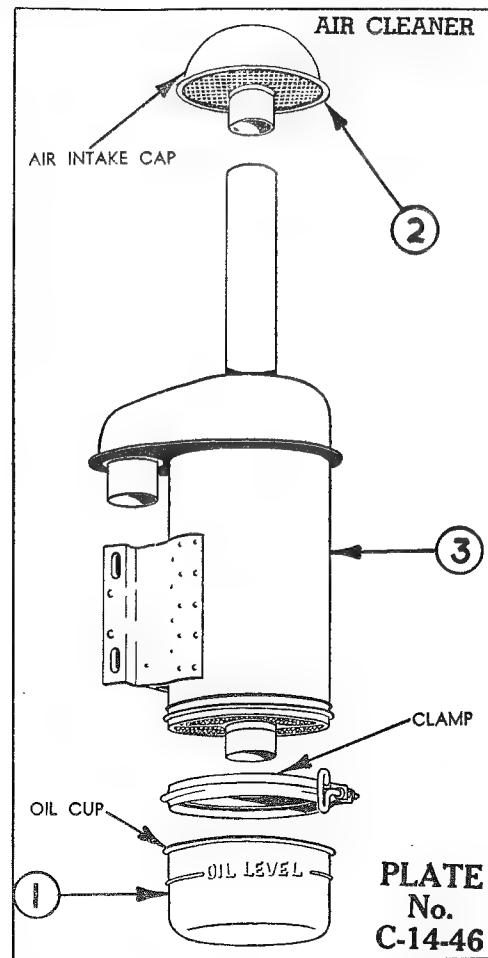
OIL FILTER
(All Models)
PLATE No. C-13-46

Clean oil in an engine insures that the bearings will be properly lubricated thus keeping them cool and giving them a long life. However, all engines form sludge while in operation and minute particles of dirt also accumulate in the crankcase; as a result, acids, gums, varnish, and other by-products are present.

To remove these harmful substances a high capacity filter is used which under normal conditions will remove the dirt, etc., for around 120 hours of operation; after this time the dirt, etc., starts to plug the cartridge and soon it will be inoperative.

Every 120 hours, as outlined above, change the element as follows:

- (1) **STOP ENGINE** —
- (2) Drain filter by removing drain plug at bottom of oil filter as indicated by arrow (1).
- (3) Remove oil filter cap as indicated by arrow (2).
- (4) Remove air cleaner cup as indicated by arrow (3).
- (5) Wipe dirt off of oil filter cap, unscrew clamping tee screw and remove filter top as indicated by arrow (4).
- (6) Remove and discard old element as indicated by arrow (5); use a clean rag and wipe out any sludge remaining in bottom of shell as indicated by arrow number (6); inspect new element and replace as indicated by arrow number (5).
- (7) Start engine and check filter for oil leaks, letting the engine run for a few minutes to allow filter to fill with oil.
- (8) Check oil level and add sufficient to replace the amount which was fed into filter.
- (9) **IMPORTANT** — Do not use cheap or substitute oil filter elements as they may be inferior in quality, poorly packed and contain foreign substances. Always carry extra elements on hand.



AIR CLEANER (All Models)

PLATE No. C-14-46

Clean air for combustion is assured by a three-stage oil-bath air cleaner. A heavy screen in the air intake cap prevents large particles from entering the air cleaner. The air then passes to the oil cup where it goes through a bath of oil. As the air rises to the outlet to the intake manifold it passes through a series of oil-bathed screens and the fine dust is removed. As the oil from the screens works back down, it carries the dirt with it and the dirt settles in the oil cup. The oil cup must be cleaned and refilled regularly with new oil.

OIL CUP SERVICE — Remove, clean, and refill the oil cup every day, as indicated by arrow (1), or after every 10 hours of operation (more frequently when operating under dusty conditions).

CAUTION — Do not remove the oil cup while engine is operating. Refill the oil cup to oil level bead with the same grade of oil used in the engine crankcase. The capacity of the oil cup is $1\frac{3}{8}$ Imperial pints.

AIR INTAKE CAP AND SCREEN — This screen, as indicated by arrow (2), should be kept clean and free from all chaff, oil, dust or paint, as clogged holes in the screen will reduce the power of the engine by restricting the flow of air.

GENERAL PRECAUTIONS — If the tractor is operating under severe dust or chaff conditions, remove the whole cleaner as indicated by arrow (3) every 75 hours and wash in kerosene, being careful to clean out the air intake pipe thoroughly. It is good practice to check the connections every day of operation to see if there are any

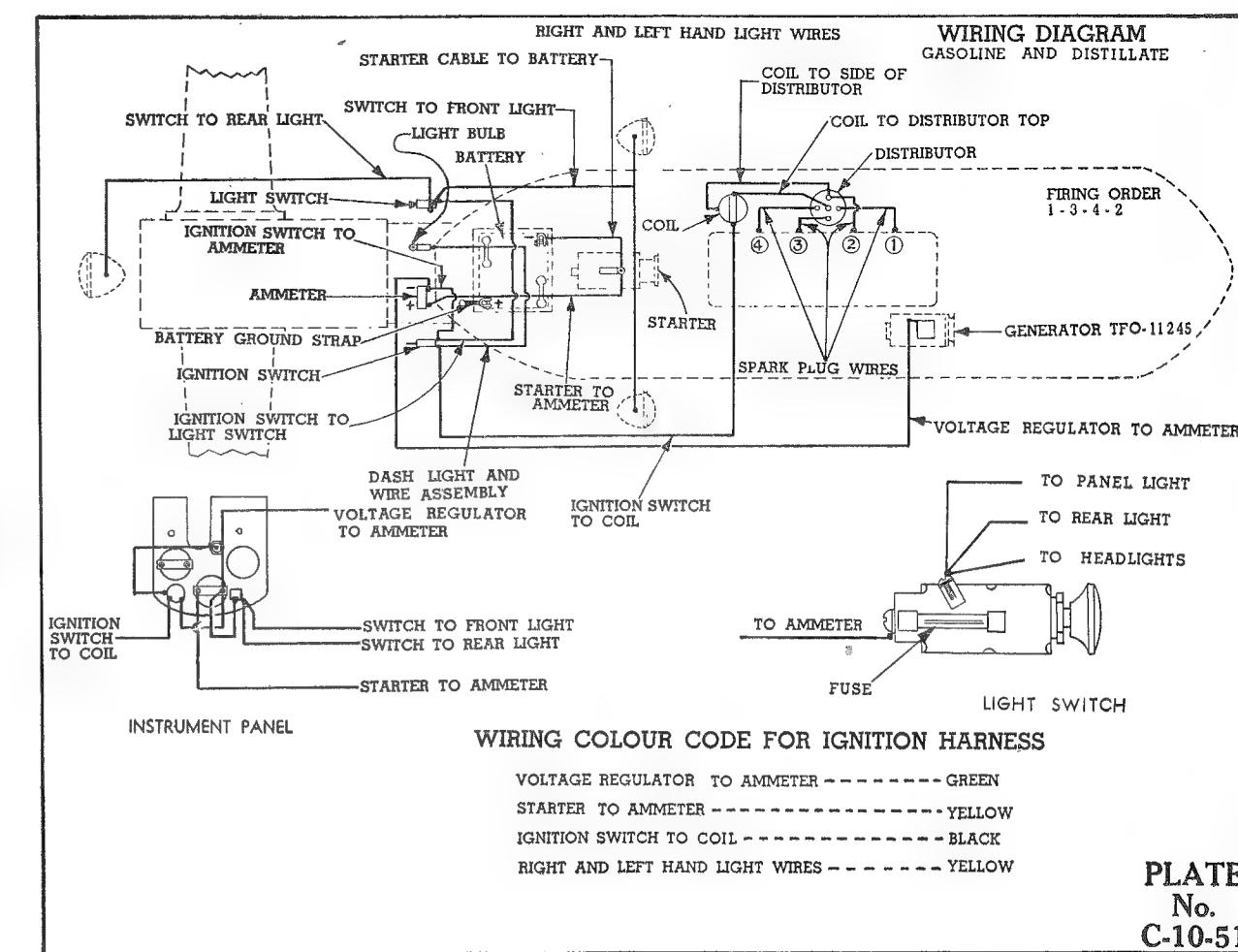
leaks, as a $1/16$ " hole will ruin an engine in a short time. Replacing deteriorated or damaged rubber connections is very important. Be careful to align the pipe carefully on assembly, tighten bolts thoroughly and re-check for leaks.

ELECTRICAL SYSTEM (Gasoline and Distillate)

DETAILED DESCRIPTION — The operator should examine the wiring diagram, Plate No. C-10-51, to understand the electrical system thoroughly.

GENERATOR — The generator provided is of the dust-proof three brush 6 volt type, controlled by a voltage regulator mounted on the generator. The generator, in normal conditions, requires little attention except the addition of 4 or 5 drops of S.A.E. 20 or 30 engine oil, every 60 hours, to the oiler at the front and rear bearings. When oiling the generator it is a good idea to also check the wiring for loose connections and worn insulation. If the generator gives trouble, it is suggested that your local dealer, who can give your generator the proper service to restore it to its original condition, be contacted.

STARTER — The starting motor which provides the power to crank the engine through a conventional bendix drive requires little attention, except to see that the cables on the switch are clean and tight, and that the insulation on the wires is not corroded or damaged. It is a good idea to occasionally check the three cap screws holding the starter to the flywheel cover to see that they are tight. No oiling is required on the unit as bushings with lifetime lubrication are provided.



IGNITION COIL — The ignition coil serves to step up the low battery voltage to the high voltage necessary to jump the spark plug gaps.

Due to their construction, ignition coils do not require any service other than to keep all connections and terminals clean and tight.

BATTERY — To service the battery, take off the battery cover after removing the wing nut and the battery hold-down clamp.

Once a week or oftener inspect the water level and bring it three-eighths of an inch above the plates by adding distilled or clean soft water. Adding more than this may mean that when the battery is warm the water may overflow through the vents, causing corrosion.

In cold weather batteries may freeze if not kept properly charged. A partly charged battery will freeze at 20°F. above zero while a fully charged battery will stand 45° to 50°F. below zero.

The battery should also be kept at a higher rate during cold weather as the demands from the starter are greater.

If the tractor is not being used during cold weather the battery should be removed and left at your dealer's for proper attention and care.

CORRODED TERMINALS — During the weekly inspection outlined above, examine the terminals for corrosion, and if present, wash off with hot water which may also be used for cleaning the top of the battery. Be sure to use sufficient water to wash all the corrosion down through the box and to the ground, as corrosion, even when washed away from the terminals, is still active and can damage the box badly. Two to three times a year remove the terminals, wash them as outlined above, then brighten them up with wire wool, apply a light coat of vaseline and reassemble, being sure to tighten the terminals carefully.

CAUTION — During the weekly inspection, check the terminals for tightness and the cables for corrosion and wear.

DISTRIBUTOR AND FIRING ORDER

PLATE No. C-20-47

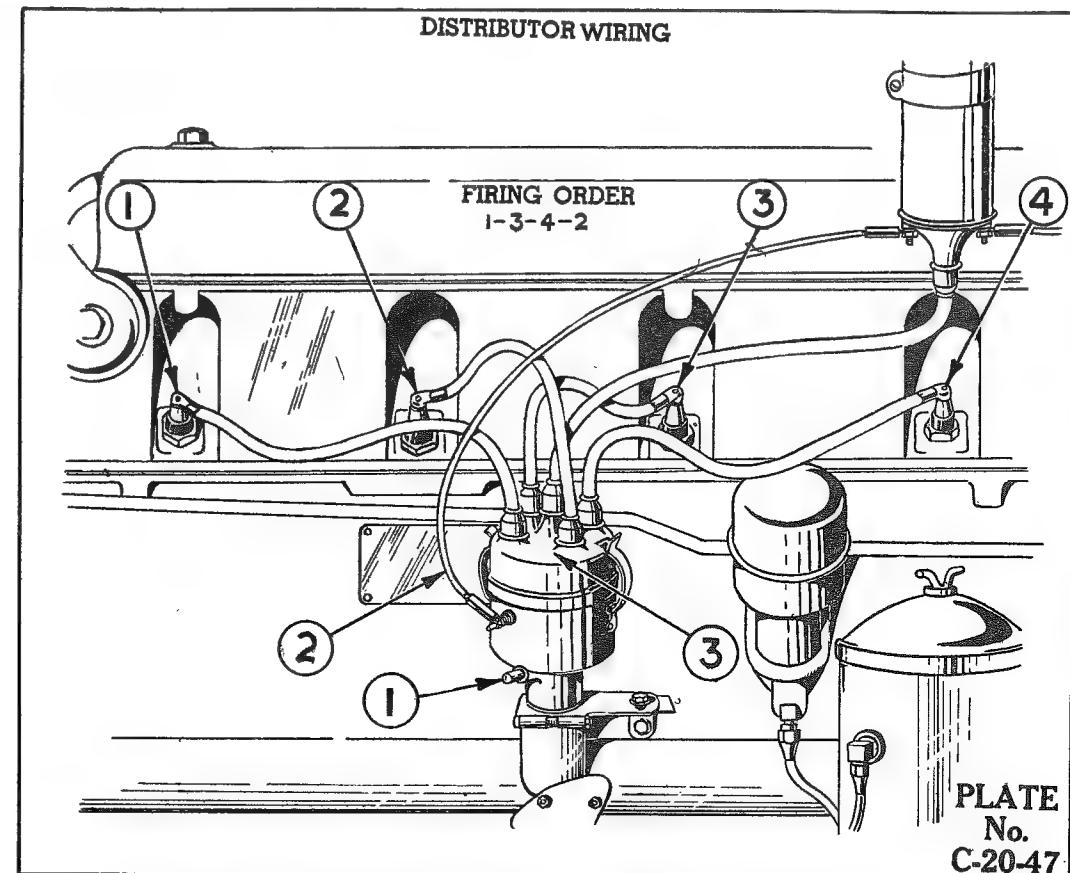
DESCRIPTION AND FUNCTION — The purpose of a distributor is to provide current to the primary winding of the ignition coil at the proper time and also to distribute the high tension voltage to the proper spark plug.

The breaker contacts of the distributor are connected in the coil primary circuit so that the rotation of a cam opens the coil circuit at the proper instant to generate a spark. The distributor cap and rotor are arranged so that the high tension voltage is connected to the correct spark plug for firing each cylinder.

The distributor provided is of the dust proof type, with a centrifugal type spark advance, and requires little attention except to add a few drops of oil every sixty hours to the oil cup as indicated by arrow (1) on the side. At the same time, the low tension wire as indicated by arrow (2) should be checked for tightness at the terminals and for wear of the insulation. The high tension leads should also be checked to see that they are firmly in their places on the distributor cap as indicated by arrow (3) and on the plugs and in the coil.

250 HOUR INSPECTION — After every 250 hours of operation, or twice a year, the cap should be removed and examined for cracks or corroded high tension terminals. If cracked the cap should be replaced and if the terminals are corroded they should be cleaned with refined "CARBON TETRACHLORIDE." DO NOT FILE THEM.

At the same time the rotor should be checked and if cracks are present it should be replaced.



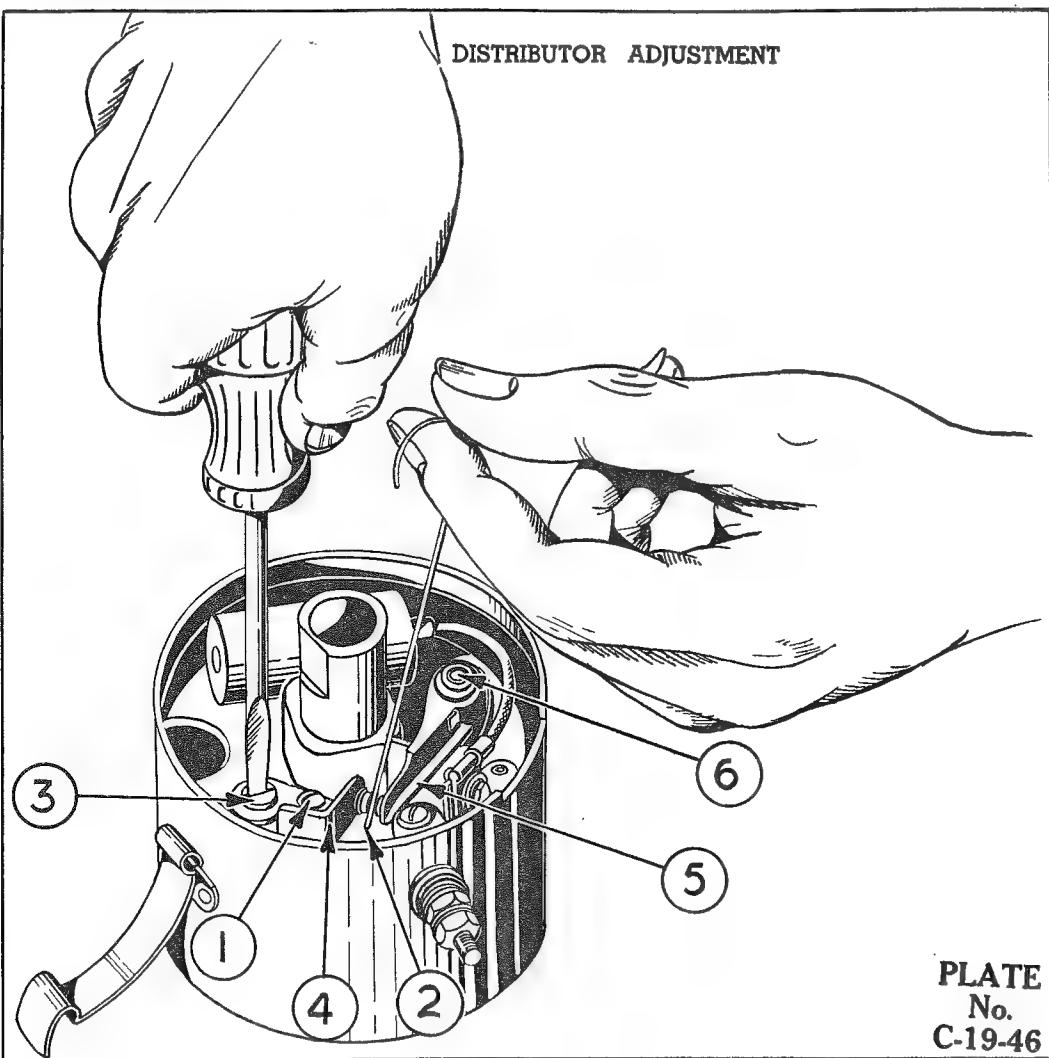
TIMING OF DISTRIBUTOR — If the distributor has been removed from the engine it is wise to retime it in relation to the crankshaft. To do this, make up two wires with small clips on one end, the other ends being connected to the terminals of dash lamp bulb. Fasten one clip to the terminal on the side of the distributor and the other clip to the screw on the advance arm. Then remove the plug in the right front of the rear engine mount and crank the engine slowly until the marks I.G.N. are just passing the hole. When the marks are in the centre of the hole the light should go on and the rotor point should be adjacent to the outlet on the cap leading to No. 1 cylinder. If this is not so, loosen the clamp screw on the advance arm and turn the distributor until the correct timing is secured. After the setting is done be sure to tighten the screw and recheck by again turning the crank slowly and replace the plug in the engine mount when through.

SPARK PLUG CABLES — If the spark plug cables are removed note the position of the cables on the distributor as illustrated on plate No. C-20.

SPARK PLUGS — Gasoline Model — Champion J-11 (interchangeable with J-5). Distillate Model — Champion J6.

Spark plugs should be cleaned every 200 to 300 hours and a gap of .025" maintained. When adjusting gap always bend the outer electrode.

CLEANING SPARK PLUGS — Never scrape or clean the insulation with anything that will scratch the porcelain. Sand blasting is much better and can be done at most service stations.



BREAKER POINTS

PLATE No. C-19-46

When inspecting the rotor and cap the breaker points should also be examined and if greyish in colour or only slightly pitted, and have a gap of between .018 to .022 they need not be replaced. If the gap is not between .018 and .022 loosen the lock screw as indicated by arrow (1) and using accurate feeler gauges as indicated by arrow (2) set points within the above limits by turning adjusting screw as indicated by arrow number (3) and recheck after tightening the lock screw. If the points are badly pitted they should be replaced, as refaced or filed contacts do not have the necessary shape and finish for satisfactory performance. If new points are not in alignment when installed bend the stationary bracket as indicated by arrow (4) to secure proper alignment. "DO NOT BEND THE BREAKER ARM" as indicated by arrow (5).

Be sure that distributor points are clean and dry.

If dirty they should be cleaned with refined Carbon Tetrachloride.

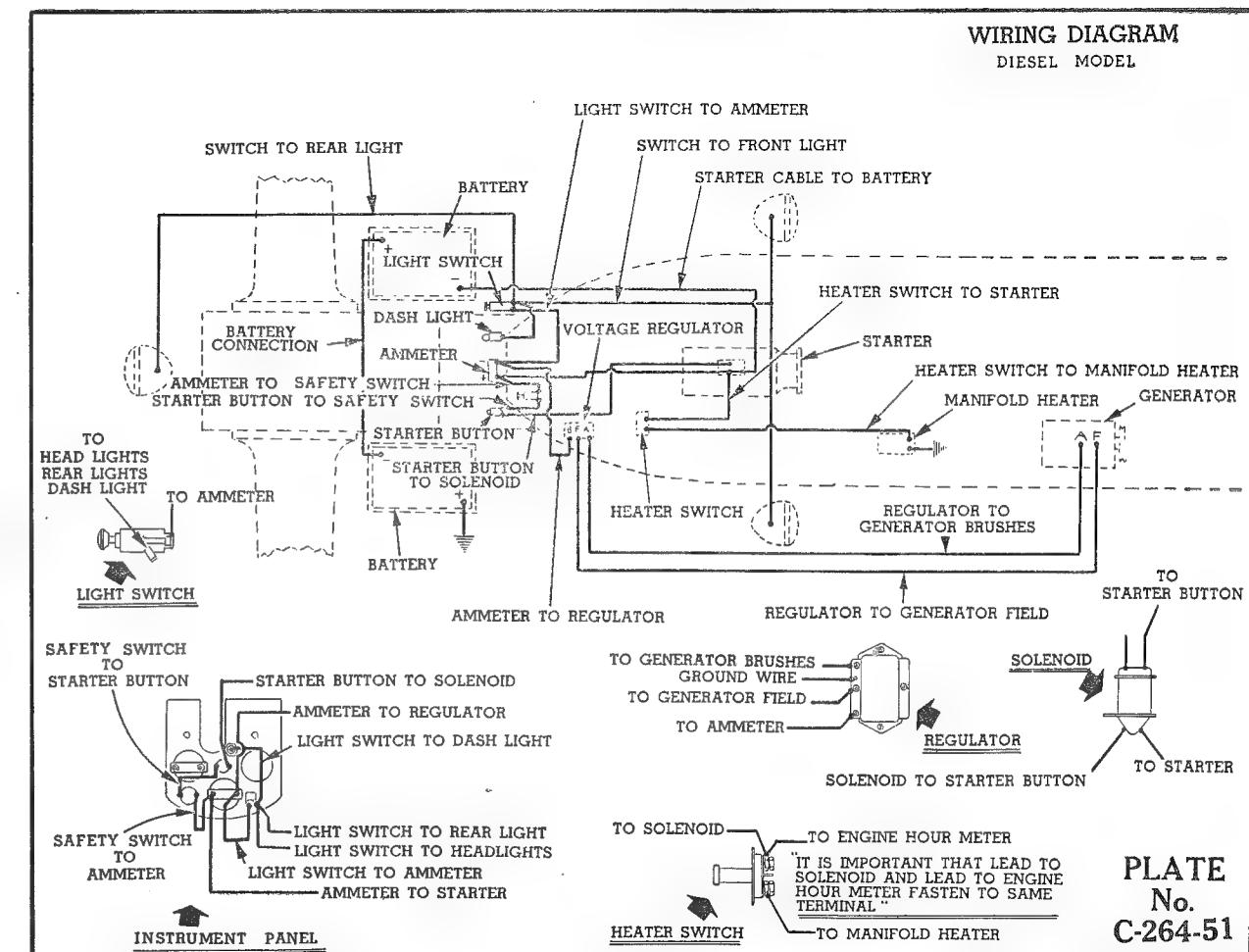
250 HOUR LUBRICATION — Add one drop only of light engine oil to the breaker arm hinge pin as indicated by arrow (6). Add 3 to 5 drops of light engine oil to the felt in the top of the breaker cam. A slight wipe of grease should be applied to each lobe of the breaker cam.

HEAD LIGHTS — Keep connections clean and tight and the nuts on the clamps supporting the lights tight to prevent excessive vibration.

ELECTRICAL SYSTEM (Diesel Models)

DETAILED DESCRIPTION — The operator should examine the wiring diagram, Plate No. C-264-51, to understand the electrical system thoroughly.

GENERATOR — The generator provided is of the dust-proof, two brush, 12 volt type, and in normal conditions requires little attention except the addition of 4 or 5 drops of S.A.E. 20 or 30 engine oil every 60 hours to the oiler at the front and rear bearings. When oiling the generator it is a good practise to check the wiring for loose connections and worn insulation. The charging rate is controlled by the voltage regulator which varies the charging rate according to the amount of charge in the batteries. If the generator or voltage regulator give trouble, it is suggested that your local dealer be contacted and he will provide the proper service to restore them to their original condition.



BATTERY — To service the battery, take off the battery cover after removing the wing nut and the battery hold-down clamp.

Once a week or oftener inspect the water level and bring it three-eighths of an inch above the plates by adding distilled or clean soft water. Adding more than this may mean that when the battery is warm the water may overflow through the vents, causing corrosion. At the same time the specific gravity should be checked and if below 1225, the tractor should be operated with the light switch in the "High Charge" position a greater portion of the time, and if up to full charge, 1270 to 1285, the "Low Charge" rate should be used a greater portion of the time.

In cold weather batteries may freeze if not kept properly charged. A partly charged battery will freeze at 20°F. above zero while a fully charged battery will stand 45° to 50°F. below zero.

The battery should also be kept fully charged during cold weather as the demands from the starter are greater.

If the tractor is not being used during cold weather the battery should be removed and left at your dealer's for proper attention and care.

STARTER — The starting motor which provides the power to crank the engine through a conventional bendix drive requires little attention, except to see that the cables on the switch are clean and tight, and that the insulation on the wires is not corroded or damaged. It is a good idea to occasionally check the three cap screws holding the starter to the flywheel cover to see that they are tight. Oil starter weekly or every 60 hours with a few drops of light oil.

CORRODED TERMINALS — During the weekly inspection outlined above, examine the terminals for corrosion, and if present, wash off with hot water which may also be used for cleaning the top of the battery. Be sure to use sufficient water to wash all the corrosion down through the box and to the ground, as corrosion, even when washed away from the terminals, is still active and can damage the box badly. Two to three times a year remove the terminals, wash them as outlined above, then brighten them up with wire wool, apply a light coat of vaseline and reassemble, being sure to tighten the terminals carefully.

CAUTION — During the weekly inspection, check the terminals for tightness and the cables for corrosion and wear.

HEAD LIGHTS — Keep connections clean and tight and the nuts on the clamps supporting the lights tight to prevent excessive vibration.

TIMING OF FUEL PUMP TO ENGINE

(Diesel Models)

SEE PLATES No. C-262-51 AND C-263-51

In timing the fuel pump to the engine, the crankshaft of the engine should be turned until the position of No. 1 cylinder, on its compression stroke, is at that position before top dead centre, as indicated by "F.P.I." marking on the flywheel, when viewed through timing hole as indicated by arrow (4), plate C-262. Remove the fuel pump timing window cover, as indicated by arrow (4), plate C-263, which is fastened to the housing by screws and carries the spring loaded shut-off for manually shutting off the fuel supply. Then with the timing window cover removed, the pump camshaft should be turned until the port closing "PC" line mark on the window aligns with the line mark machined in the apex of one of the teeth on the plunger drive gear, which is visible through the opening. In this position plunger port closing occurs for number 1 outlet of the pump.

Remove the adjusting cover, as indicated by arrow (5), plate C-263 and pipe plugs, as indicated by arrow (6), plate C-263.

Install pump drive gear on pump flange hub leaving the 3 cap screws loose. Then mount the pump on the engine meshing the pump drive gear with the cam gear so that the 3 cap screws are as close to the centre of the slots as possible.

For accurate timing, look through the pipe plug holes and align the mark on the rim of the drive hub flange with the inscribed line on the end of the timing pointer. It is also necessary to check the marks on the timing window to make sure the port closing is for number 1 outlet. Now tighten the 3 cap screws in the pump drive gear.

The timing should be rechecked by backing off the crankshaft 1/4 turn and then bringing it up to the timing mark (F.P.I. mark) again. The mark on the rim of the pump hub should be in alignment with the inscribed line on the end of the timing pointer. If these two marks are not in alignment, loosen the capscrews in the pump drive gear and line up the marks by turning the pump cam. Then recheck again as outlined.

Replace timing window cover, the adjusting cover, and pipe plugs.

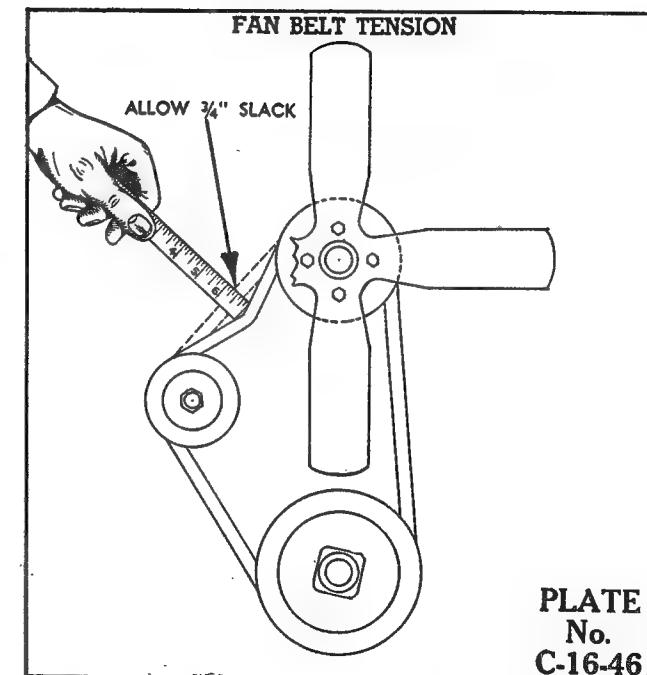
COOLING AND OVERHEATING

(All Models)

PLATE No. C-16-46

COOLING DESCRIPTION:

The heat given off from the engine is carried away by the radiator, assisted by the high capacity pump and fan. At the block outlet is a special thermostat which, until the engine reaches operating temperature, returns the liquid to the block through the large by-pass. The cylinder walls are cooled by thermosyphon, thus preventing local hot and cold spots which might cause distortion, and an uneven wall wear.



The capacity of the cooling system is (3) Imperial gallons, (3-1/2) U.S. gallons.

CARE — Try to use rain water when filling to prevent the addition of lime and other impurities. Fill within (1) inch of the top. **DO NOT ADD WATER TO AN ENGINE THAT IS OVERHEATED AND PARTLY EMPTY.** Wait until it cools.

OVERHEATING — As the different units of the cooling system have been carefully designed and thoroughly tested, should overheating occur, check the following:

- (1) Check water level in radiator, the oil pressure gauge, oil level in crankcase.
- (2) Check the fan belt for slippage; it should not exceed $\frac{3}{4}$ of an inch as shown on above plate and indicated by the arrow.
- (3) Check the ignition timing as per instructions on page 35.
- (4) Open the throttle fully, remove the radiator cap and see if coolant is circulating.
- (5) Examine the radiator hose for deterioration and replace if rubber is loose in the inside.
- (6) The radiator core protective screen may be plugged. Blow out with an air line or water hose from the back.
- (7) The radiator or block may plug with foreign matter: To clear; drain out system, then fill with solution of $1\frac{3}{4}$ pounds of ordinary washing soda to 3 Imperial gallons of water, then run engine until hot, with radiator cap off. Stop the engine, drain solution, refill with clean water.

COLD WEATHER OPERATION

(All Models)

If run in cold weather be sure to drain the water after each operation or use a good anti-freeze solution. Ethylene Glycol is recommended in place of Denatured Alcohol, which boils at just over 170°F . The following table is a guide for the amount to be added.

NOTE: The water pump has a lifetime packing and should require no attention.

Freezing Point Fahrenheit	Imperial Pints of Anti-freeze Required	
	Ethylene Glycol	Denatured Alcohol
10°	6	6
0°	8	9
-15°	10	11
-25°	11 $\frac{1}{4}$	12
-32°	12	13
-42°	12 $\frac{3}{4}$	15 $\frac{1}{2}$
-62°	14 $\frac{1}{2}$	19-1/5

CAUTION — Use only one type of anti-freeze solution. Do not mix solutions, as it will be difficult to determine the exact amount of protection you have.

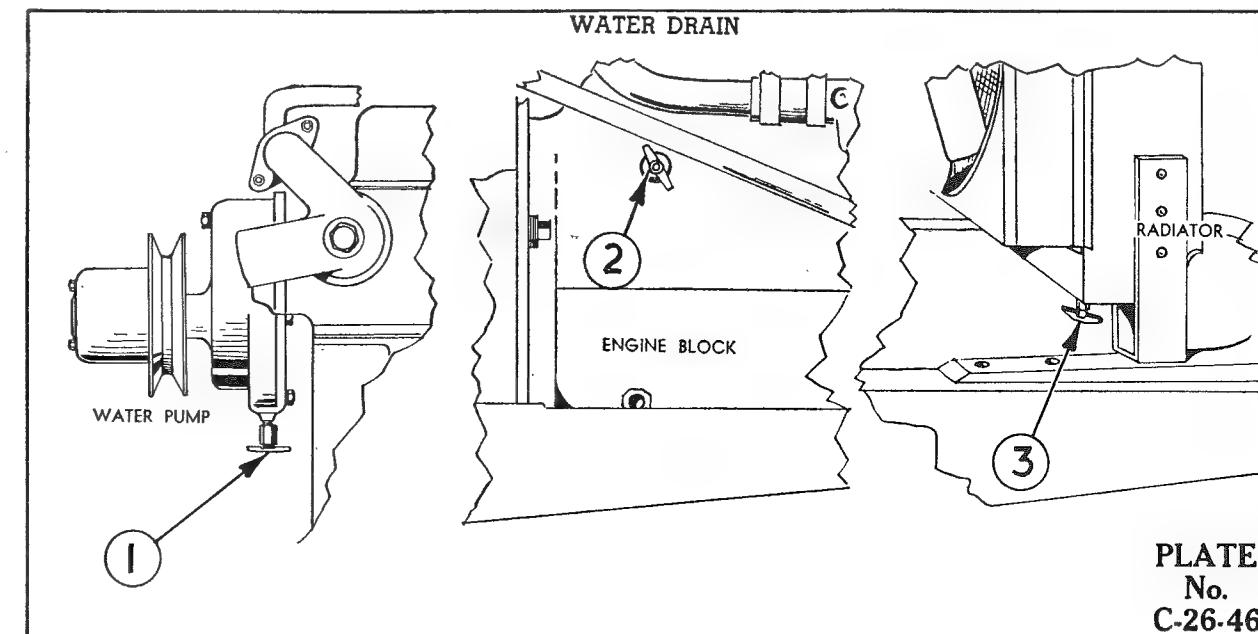
NEVER USE ANY
OF THESE AS AN
ANTI-FREEZE
SOLUTION

—Honey, Salt, Kerosene, Fuel Oil,
Glucose, Sugar, Calcium, Chloride,
or any Alkaline Solution.

THERMOSTAT — (Factory equipped)

Gasoline and Diesel — 175°F .

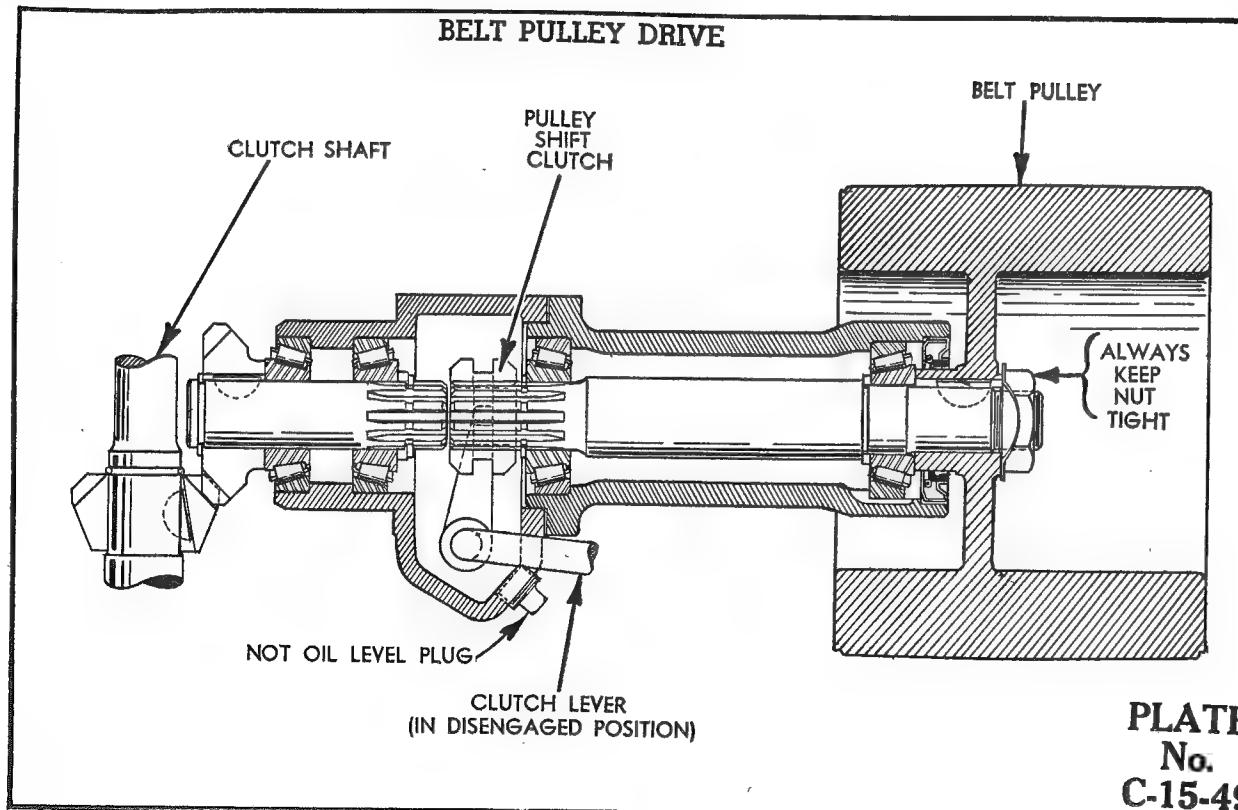
If alcohol is used change to 161°F . thermostat.
Distillate Model — 195°F .



DRAINING SYSTEM

PLATE No. C-26-46

The tractor should be level before starting to drain. There are 3 drain cocks. One cock is under the water pump as indicated by arrow (1). One is under the right side of the radiator as indicated by arrow (3). One is on the right rear of the engine block as indicated by arrow (2). If the water does not flow freely from any of the cocks they should be removed and cleaned, then start the flow with a small wire.



BELT PULLEY SHIFT

PLATE No. C-15-49

CARE OF BELT PULLEY — It is suggested that when considerable field work is to be done, that the belt pulley and shifting case be removed as a unit to prolong the life of the Rockwood pulley. First drive the tractor up on an incline or jack up the right side or pulley side of the tractor. This will prevent the oil running out when the pulley and shafting case is removed and will then make it unnecessary to drain the oil to remove the unit. To remove the unit, remove the cap screws that hold it to the tractor frame and pull it out, being careful to keep it free of dirt and foreign matter. Wire the shims to the unit to prevent loss, store in a clean place. Install the special cover plate, which is supplied with four cap screws. If the tractor is left out in the weather with the pulley on, the pulley should be covered with a shield to prevent damage by the elements to which it is exposed.

To engage or disengage the pulley drive, with the engine running, depress the main clutch pedal and shift it in or out as desired. When starting up a heavy separator or other machines release the clutch gradually to prevent undue belt slippage and troublesome starting. **CAUTION**: To avoid static electricity when doing belt work, ground the tractor with a short chain.

BELT PULLEY SHIFT — Before throwing the belt clutch in or out of gear, let the tractor idle and then fully depress clutch pedal. This is necessary, so that the pulley spline shaft will not be damaged when changing gears.

TRANSMISSION

PLATE No. C-12-51

CONSTRUCTION — A sliding gear type transmission is used giving four forward speeds and one reverse. An additional "CREEPER GEAR" can be installed as an extra in the intermediate gear case, giving a total of 8 speeds forward and two reverse. The latest types of alloys are used in the heat-treated gears and shafts.

SHIFTING — Conveniently located at the base of the shift lever is a guide which shows the desired speeds. Shifting should be done with no clashing and the clutch should be released slowly so as to prevent jerking the tractor and throwing an unnecessary strain on the whole transmission and tractor. To shift from, or to, the "CREEPER" SPEEDS, leave the main lever in neutral and shift the creeper control, as you would an ordinary shift lever, to the desired position. See paragraph, "Creeper Gear Shift."

LUBRICATION — Four and one-quarter Imperial gallons of S.A.E. 90 extreme pressure (mild) transmission oil are required to bring the oil level up to oil level plug which is located on the left side of the case. See Plate C-9, item 21, on page 22.

CREEPER GEAR SHIFT — **IMPORTANT** — Do not change from standard gear to creeper gear or from creeper gear to standard gear while tractor is in motion. STOP the tractor and fully depress clutch pedal and then change from standard to creeper gear.

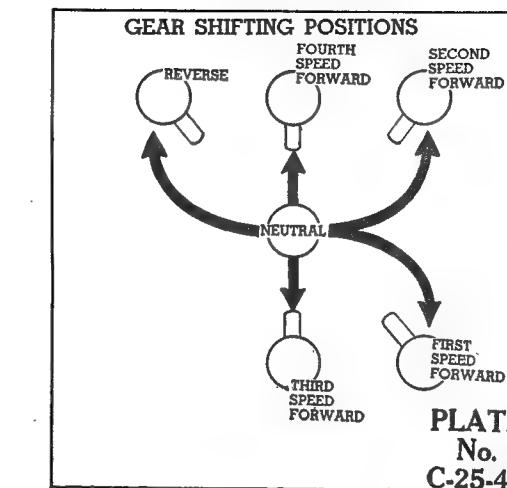
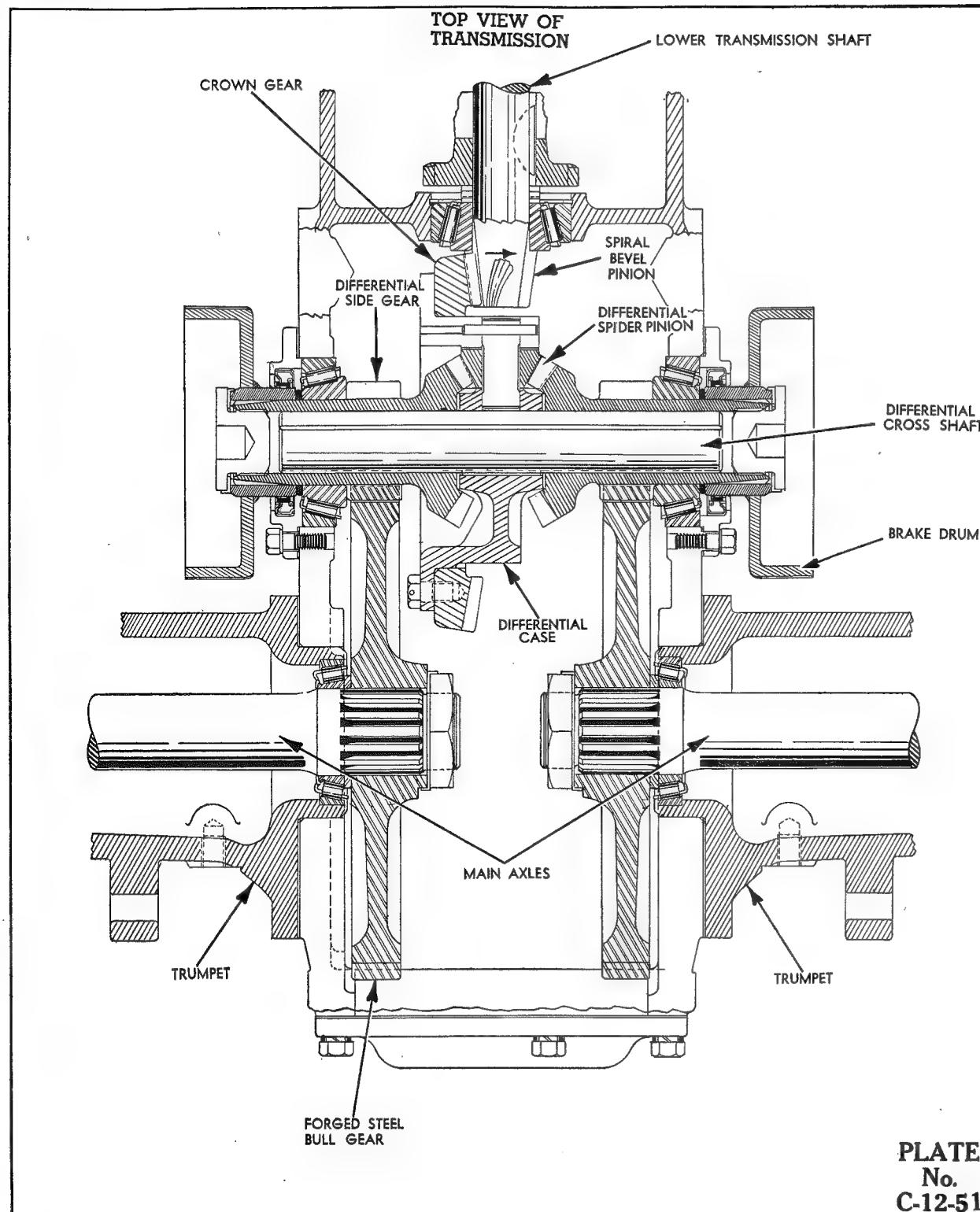
B R A K E S

BRAKES — Each rear wheel is controlled by a separate pedal acting through linkages to internal and external shoes which contact the drums fastened to the bull pinions. With this construction each wheel may be braked independently for short turns or together for even action.

BRAKE OIL SEALS — To prevent oil seeping out past the brake drum threads a special rubber ring is used between the drum and bearing. If this special seal is removed it should be replaced with a little vaseline on the surface of the seal for easy application and long life.

ADJUSTMENT — The pedals should have a free movement of one inch to prevent brake drag and if more play develops, they should be adjusted. This is easily done by reducing the length of the brake rod (by turning down clevis). Be certain to have equal brake tension on both wheels. This can easily be checked by jacking up both rear wheels, starting the engine and depressing the pedals the same amount with the wheels running in 4th gear. Both wheels should slow down at the same time and also tend to reduce the speed of the engine.

CAUTION — Always lock the pedals together when going over 6 miles per hour.



GEAR SHIFT LEVER

PLATE No. C-25-46

This is of the automotive type, and has four speeds forward, one reverse. Be sure the clutch is disengaged before making a gear shift.

CLUTCH

The engine drive is taken through a spring loaded dry disc single plate clutch and is designed so that it requires a minimum of attention.

CARE AND ADJUSTMENT OF CLUTCH

It is very important that free clutch pedal travel be maintained at from 1" to 1 1/8". After a new tractor has run for a short while this travel should be checked and adjustment can easily be made by means of the clevis at the front end of the clutch rod. During normal tractor service the driver must watch to see that the free travel be maintained as if it is less than this the clutch is apt to slip and be badly damaged, and if more than 1 1/8" the clutch may not release completely when depressed, making shifting difficult.

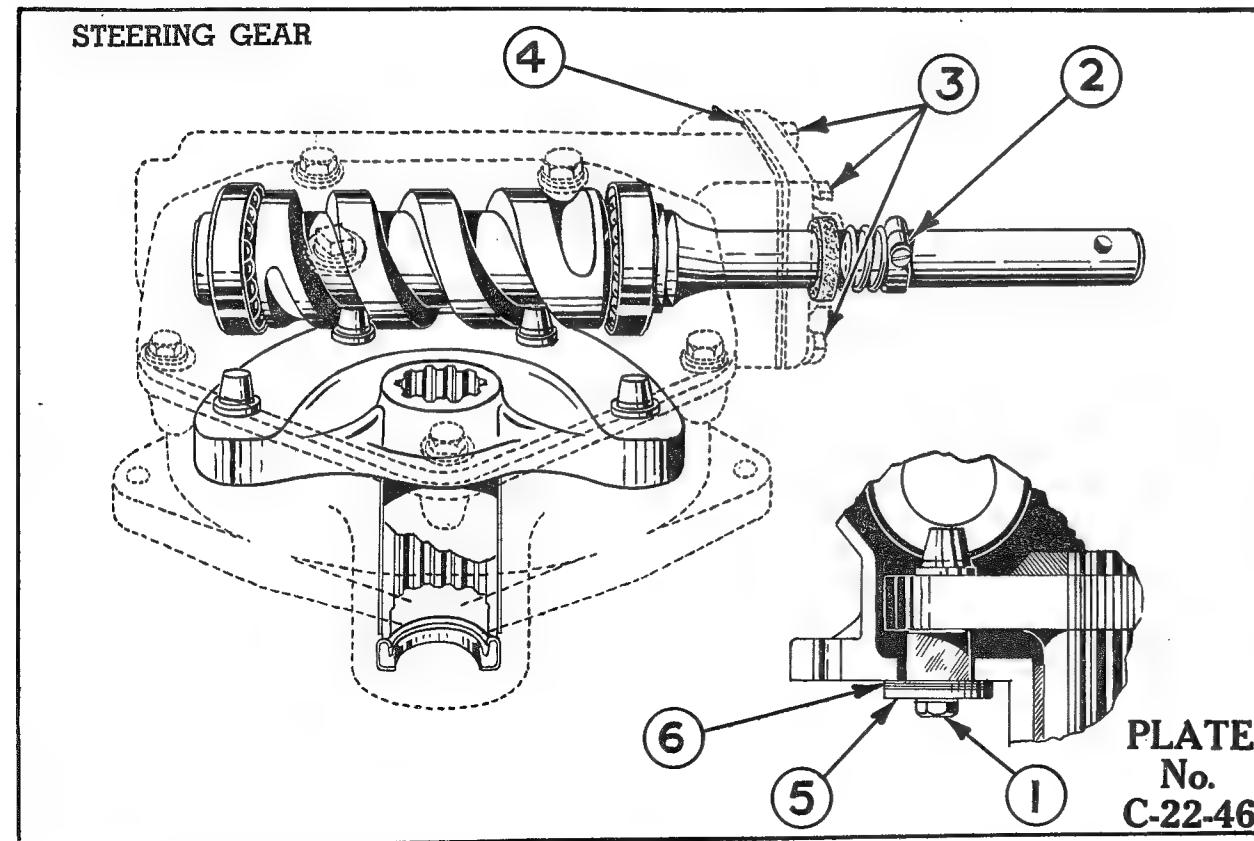
During the operation the driver should refrain from keeping his foot on the clutch pedal to prevent slipping while in use.

STEERING GEAR ADJUSTMENT

PLATE No. C-22-46, on Page 46

There are two adjustments on this steering gear. Both are shim adjustment.

- (1) To adjust the ball thrust bearing on the cam to a barely perceptible drag loosen the two cap screws as indicated by arrow number (1), holding the adjusting pad in order to free the studs in the cam groove. Release the clamp as indicated by arrow number (2) of the oil seat unit. Unscrew the four cap screws as indicated by arrow number (3) and move out cover to permit removal of shims. (Shims are of .002", .003", and .010" thickness. Clip and remove a thin shim as indicated by arrow (4) or more as required. Tighten all four cap screws. Test adjustment and if necessary remove or add shims until adjustment is correct. Replace cover and reset clamp of oil seat unit and tighten.
- (2) To adjust backlash of tapered studs in cam groove so that a very slight drag is felt when gear is turned from extreme left position or extreme right position, or vice versa. Remove adjusting pad as indicated by arrow number (5) to permit removal of shims. (Shims are of .003", .007", and .010" thickness.) Remove one thin shim as indicated by arrow number (6) or as required. Reassemble pad and shims and tighten. Test adjustment and if necessary repeat operation by removing or adding shims until adjustment is correct.



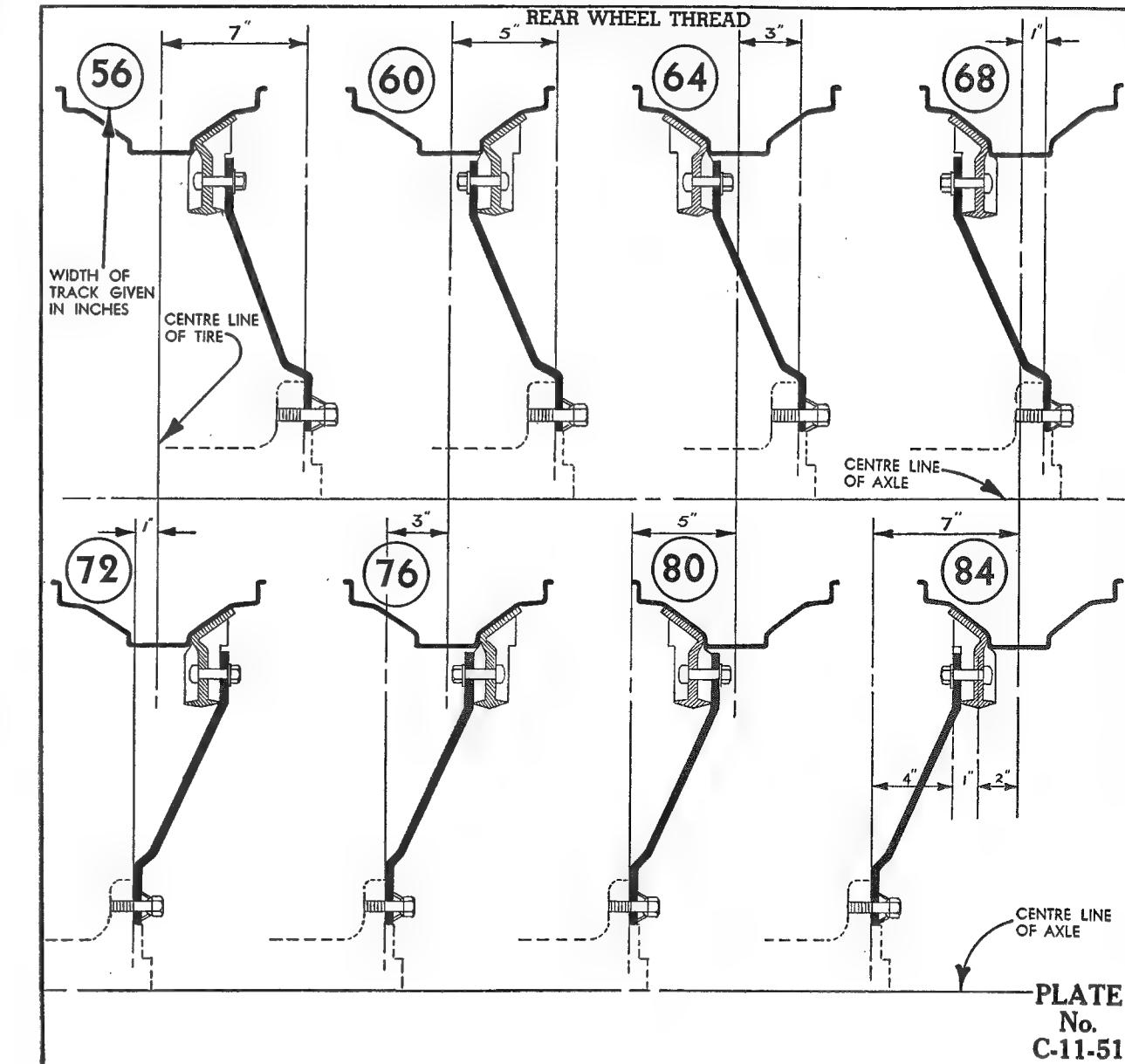
STEERING MECHANISM AND FRONT WHEELS

STANDARD WIDE AXLE TRACTOR — Carefully designed for easy steering, the main units are made of tough steel forgings accurately machined to secure good alignment. The latest type of easy action tie-rod is used to connect the highly efficient steering gear to the front wheels.

WHEEL ALIGNMENT OF STANDARD WIDE AXLE TRACTOR — To check alignment, first check wheel bearing adjustment as described below then jack the front end up so that the wheels are free to turn, measure the distance between the in-sides of the tires at hub height, in front of the axle, turn each wheel exactly one-half turn and measure between the same points behind the axle. The measurement taken in front of the axle should be $\frac{1}{8}$ " less, and if not, loosen the tie rods, turn each one the same amount and re-measure. Turning the wheels one half turn as described above eliminates any errors due to weave in the wheel disc.

FRONT WHEEL BEARING ADJUSTMENT — Frequently one should jack up each front wheel, try moving the wheel from side to side and if even the slightest movement is present between the wheel and hub remove the hub cap and pull the cotter pin. Then tighten the adjusting nut while at the same time turning the wheel by hand until slight binding is felt. Be sure to use a new cotter pin if any cracking is present. BE CAREFUL to keep dirt or other foreign matter out of the grease or hub cap, which may now be assembled. Occasionally one should go over the nuts on the hubs, radius rod end and steering arms to see if they are tight.

CARE — To maintain easy steering and to prolong life, grease all fittings and service the steering gear as described on page 21. Adding new grease is an excellent means of repelling dirt and other foreign matter.



REAR TREAD ADJUSTMENT ON ROW CROP MODELS

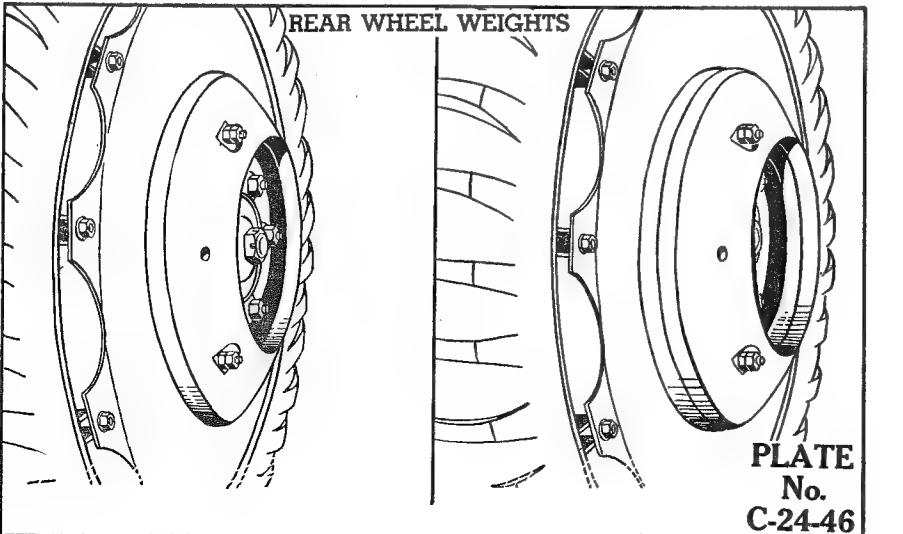
PLATE No. C-11-51

By means of a special disc and rim the rear track can be adjusted from 56 to 84 inches in 4-inch steps on row crop models to accommodate the different widths of row crops and the varying demands of farmers. Splined axles with their troublesome clamping arrangements are avoided, and by following the illustrations and the following example, the desired tread can be easily secured.

The right rear wheel is shown in section as it appears when adjusted to the different widths of tread. The figures in circles show the tread width provided in the adjacent view, and on examining the different views it will be noticed that by using a rim with a special offset clamp and the special dished disc wheel the different adjustments are

easily secured. Bearing in mind that more efficient traction is secured when tires are run in the direction specified on them, the tires from the opposite wheel should be used when tread with widths 64, 68, 80 and 84 are used.

EXAMPLE — To use a tread width of 80 inches when the tread has been set for 56 inches, jack up the rear wheels carefully and block the front wheels to prevent shifting, remove the rim bolts, and the bolts holding the disc to the hub. Then shift the tires to the opposite side of the tractor, re-install the discs on the hub with the dished side out, then mount the rims to the discs with the clamp inside the disc. **TIGHTEN ALL BOLTS AND NUTS SECURELY.**



REAR WHEEL WEIGHTS

PLATE No. C-24-46

REAR WHEELS — The drawbar pull of a tractor can be increased by adding weight to the driving wheels. This may be accomplished by adding cast iron weights to the wheels, or by the use of liquid in the tire tube or both if necessary, depending on the type of soil.

LIQUID WEIGHT — Tractor tires may be filled with a liquid to an extent recommended by the tire manufacturer concerned. Consult your dealer for recommended percentage of liquid to be used in your tractor tires. For temperatures above 30° F. use clean water as a liquid. When operating in temperatures below freezing (32° F.) a solution of calcium chloride is recommended. A solution of approximately 23 pounds of flaked calcium chloride to 10 Imperial gallons (12 U.S. gallons) of clean water is recommended when operating under freezing temperatures. The specific gravity of 1.225 gives a freezing point of — 25° F. for the solution. To prevent heating when mixing always add the chloride to the water slowly — NOT the water to the chloride. Allow solution to cool before using.

NOTE: Your dealer is equipped to put a liquid solution in the tires.

CAST WEIGHT — The drawbar pull of a tractor can be increased by adding cast iron wheel weights. They are available from your dealer in sets of two, one for each rear wheel. Each weighs approximately 140 pounds. For added traction, one or two sets of weights may be installed, as shown in Plate No. C-24, Page 48.

CAUTION: OVERLOADING — Do not load the tires beyond their rated capacity. In adding weights consideration must be given to the load capacity of the tire.

DRAW BAR PULL — Your tractor will develop more draw bar pull in pounds if the tires are filled with a calcium chloride solution. Less slippage and less tire scruffing and longer tire life will be secured by filling the tires with calcium chloride.

PNEUMATIC TIRES

MOUNTING OF TIRES ON RIMS — After rear tires are mounted on the rims they should be inflated to 30 pounds pressure in order to force the tire beads firmly into the rims. The rim and tire are tapered, so this pressure is necessary in order to force the beads firmly into place.

The tire should be inflated to 30 pounds pressure every time the tire bead is pushed away from the rim seat at any point. Then the pressure should be dropped to the recommended pressure as given in the following paragraph, "INFLATION". This practice should be followed, as otherwise the tire will slip on the rim and shear off the valve stem.

INFLATION — Inflation to the proper air pressure is the most important factor in the satisfactory performance and maintenance of tractor tires. For the front tires, 5.50 x 16, the proper air pressure is 28 pounds; 7.50 x 16 tires, the proper air pressure is 20 pounds; 7.50 x 10 tires, the proper air pressure is 36 pounds; and for the rear tires, 10.00 x 38, it is 12 pounds, except when plowing, when the pressure in the rear furrow tire should be increased by 4 pounds, giving 16 pounds pressure.

Both under inflation and over inflation are harmful. Under inflation will damage the cord body of the tire. It will cause a series of diagonal breaks in the cord fabric in the sidewall area. This usually occurs on the inner side wall of the furrow wheel tire. Under inflation will result in repeated buckling of the sidewall and constant buckling will break the cord fabric.

Inflation should always be high enough, especially in the furrow wheel, so that the tire will not buckle. The buckling can be seen, especially on hard pulls, by the driver or someone walking along the side of the tractor. If the tire buckles or wrinkles the air pressure should be increased to the point where the sidewalls remain smooth while the tractor is pulling on the tire. Under inflation may also allow the tire to slip on the rim, which in turn will tear off the valve stem of the tube. Over inflation should also be avoided. It causes loss of traction, which results in excessive slippage, causing tires to wear more rapidly.

METHODS OF INFLATION — Inflation with a hand pump is not difficult when only a few pounds are needed to inflate to the recommended pressure.

Spark plug tire pumps which will inflate the tire in from 5 to 6 minutes can be purchased from your dealer.

AIR PRESSURE SHOULD BE CHECKED FREQUENTLY — Air pressure should be checked every week, and should not be allowed to drop below the recommended pressure. A special low pressure gauge, with one pound graduations (such as a Schrader No. 9350) is necessary in order to get accurate inflation. Gauges should be checked occasionally at a tire service station, as they get out of order and a correction in the reading might have to be made. Always use caps on the valves as this prevents loss of air. It is not advisable to reduce air pressure in order to increase traction as damage to tire is likely to result.

CARE OF TIRES — To insure the maximum of hours of service, watch the tread lugs — if they wear too fast, immediately add more weight.

To cut down the slippage, check for high air pressure. Keep tires free from oil or grease, and avoid driving over sharp obstacles, such as stones, etc., which might cut the tires. All cuts should be repaired immediately.

TIRE PROTECTION DURING STORAGE — When not in use your tractor should be stored so that the tires are protected from the light. Before storing, the tires should be thoroughly cleaned with water.

If it is to be stored for a long period, jack it up so that the load is off the tires. If it is not jacked up, tires should be checked at regular intervals for proper inflation.

AIR PRESSURE ON TRACTORS TO BE SHIPPED — When a tractor is transported by rail or truck, all 4 ply front tires should be inflated to 30 pounds; all 6 ply front tires to 36 pounds; all rear tires to 30 pounds. This makes possible rigid blocking and prevents bouncing.

IMPORTANT — After the tractor is unloaded, and before the tractor is operated, be careful to deflate the tires to the correct pressures, as given in a preceding paragraph.

HITCH

ADJUSTMENT — In all cases the hitch should be adjusted so that the centre line of pull of the tractor will fall in line with, or at least near, the centre line of draft of the hitch on the implement. Incorrect hitching will result in difficult steering and unsatisfactory work of the implement and causes unnecessary strain on the tractor, and implement, being sufficient in some cases to cause permanent damage. Make full use of the range adjustment provided by the holes in the braces to the tractor axles and by the sideways adjustment of the drawbar in the drawbar frame.

STORING AND HOUSING YOUR TRACTOR

When your tractor is not to be used for a period of time, it should be stored in a dry and protected place. Leaving equipment exposed to the weather, for even short periods, materially shortens its life as useful equipment.

The following procedure is recommended for storing your tractor, and the lubrication precautions should be repeated every 6 months thereafter.

- (1) Wash or clean and completely lubricate the tractor, referring to the "Lubrication Chart."
- (2) Drain and flush the cooling system thoroughly, making sure all three drain cocks are opened.
- (3) Remove the battery. Clean it off with hot water and leave it at your dealers for proper attention and care while not in use.
- (4) Let the engine cool off then remove the spark plugs and pour one tablespoonful of S.A.E. 50 lubrication oil into each cylinder. Now turn engine over, 2 or 3 revolutions, to evenly distribute the oil over the cylinder walls. Then replace spark plugs.
- (5) Remove valve housing cover and remove any rust found. Then flush valves, push rods, and rocker arms, with S.A.E. 50 lubricating oil. Replace valve housing cover.
- (6) Remove oil filter element and, after cleaning the filter, replace with a new element.
- (7) Plug the ends of the breather pipe and exhaust pipe.
- (8) Drain fuel tank and carburetor, and then clean out fuel strainer glass bowl.

NOTE: Gum formed in fuel tank lines and carburetor while in storage may be dissolved with "Acetone" or a 50-50 mixture of alcohol and benzol.

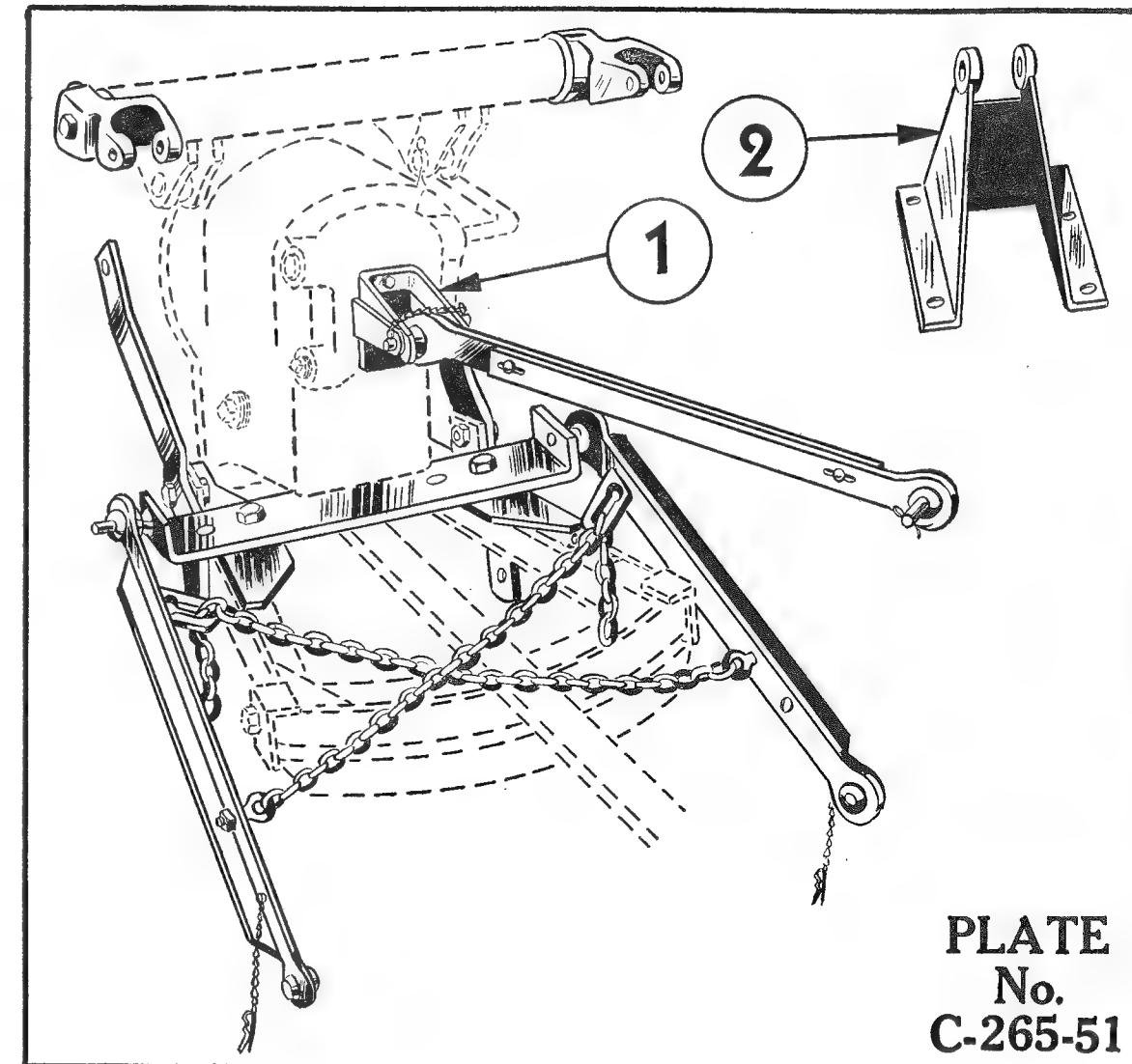


PLATE
No.
C-265-51

THREE POINT HITCH FOR

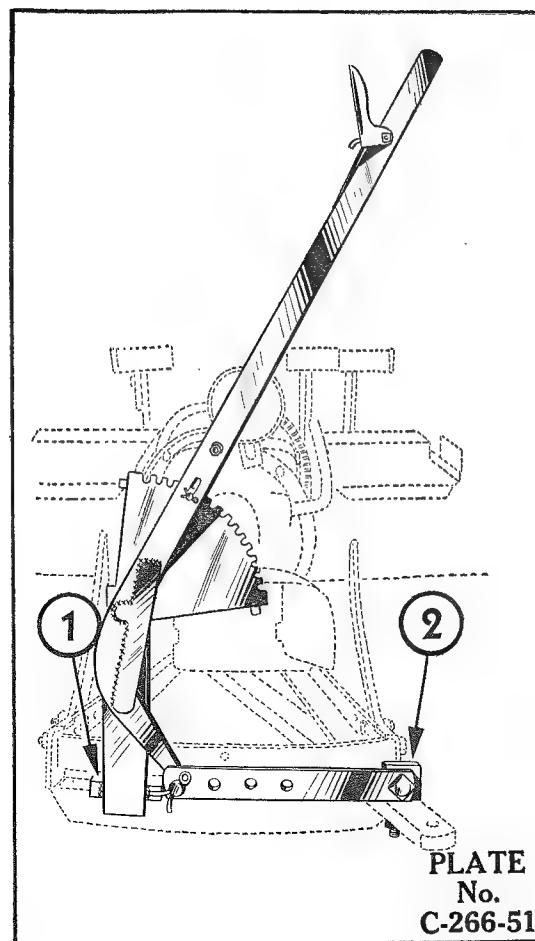
CO-OP REAR MOUNTED PLANTERS

PLATE No. C-265-51

Mount the three point hitch on the tractor as shown.

Tractors equipped with live power take-off require bracket shown by arrow (1).

Tractors not equipped with live power take-off require bracket shown by arrow (2).



DRAW BAR SHIFTING LEVER ATTACHMENT

PLATE No. C-266-51

Attach shifting lever attachment to hitch frame assembly, as shown by arrow (1), with two bolts.

Attach pivot for shifting lever attachment to draw bar, as shown by arrow (2).

LIVE POWER TAKE-OFF

The rear section of the Live Power Take-off may be easily installed in the field by following the following procedure:

1. Drain the differential housing.
2. Remove the rear cover of the differential housing.
3. Place the gear shift lever in third gear to provide clearance for the collar on the rear section of the Live Power Take-off shaft to pass the sliding gear in the transmission.
4. The original gasket is used between the Power Take-off and the differential housing. The rear Live Power Take-off can be turned by hand to align the splines in the collar and the splines on the front Live Power Take-off shaft. Having aligned the splines, slide the unit forward onto the dowels and studs in the rear of the differential housing. Tighten nuts securely on studs.
5. Refill differential case with lubricant adding an extra 8½ pints of lubricant for the Live Power Take-off.

AMERICAN BOSCH SERVICE STATIONS

Diesel Fuel Injection Pump Maintenance
United States and Canada

ALABAMA

Birmingham, 3

Birmingham Electric Battery Co.

Ave. B and 23rd St. S.

ALASKA

Juneau

Parsons Electric Company

ARIZONA

Phoenix

Charlie C. Jones Battery &
Electric Co.
Perkins Diesel Service

2nd and Seward Sts.,
P.O. Box 1749

318-322 W. Jefferson St.
747 South Mesa Blvd.

CALIFORNIA

Fresno
Los Angeles

Winther Bros.
Diesel Injection Equipment Co.

Los Angeles, 21
Sacramento, 6
San Diego
San Francisco, 3
Salinas
Wilmington

Magneto Sales & Service Co., Inc.
Langner & Rafkin
Magneto Sales & Service Co.
Furer & Uster, Inc.
Haag Diesel Electric
Diesel Control Corp.

612 Divisadero St.
4847 Anaheim Telegraph
Road
751 Towne Ave.
1116-22 15th St.
1254 Kettner Boulevard
225 Seventh St.
37 Abbot St.
218 N. Marine Ave.

CANADA

Calgary
Edmonton
Saskatoon
Vancouver
Vancouver
Vancouver
Winnipeg
Fredericton

Hutton's Limited
Smith Battery & Auto Electric
H. Lambert Electric
Jeffree & Jeffree Limited
Vivian Engine Works Ltd.
MacFarlane & Co.
Brown & Murray Limited
Stairs Bros. Fuel Injection
Service Station
A. Cross & Co. Ltd.
Internation Electric Co. Ltd.
Quebec Gas & Diesel Engines Ltd.
Electric Motor Service

131 11th Avenue W.
10125 105th Street
114-116 Avenue A. North
775 Homer Street
1660 Station Street
1955 Columbia Street
237 Fort Street
493 Northumberland St.

Toronto
Montreal
Quebec
Regina

45 Elm Street
1037 Bleury Street
15 Sault-au-Matelot St.
1734 Broad Street

Denver, 3

COLORADO
Central Supply Company

1171 Lincoln St.

Washington

DISTRICT OF COLUMBIA
Diesel & Ignition Service Inc.

925 Girard St., N.E.

AMERICAN BOSCH SERVICE STATIONS

FLORIDA		
Jacksonville	Patten Sales Co., Inc.	1021 Hogan St.
Jacksonville, 1	Spencer Electric, Inc.	40 W. Beaver St.
Miami, 36	Florida Diesel Service Co.	1930 No. Miami Ave.
West Palm Beach	Sutcliffe's Electric Co.	222 North Olive Ave.
Tampa	Stuart Diesel Service	3101 4th Ave.
GEORGIA		
Atlanta, 3	Auto Electric & Magneto Co.	477 Spring St., N.W.
HAWAIIAN ISLANDS		
Honolulu	Honolulu Iron Works Co.	28 North Queen Street
Honolulu, 2	Todoki Machine & Marine Works	810 Halekauwila Street
IDAHO		
Lewiston	Osterman Diesel & Electric Co.	1610 Main St.
Boise	Midwest Service Supply Co.	1208 Grove St.
ILLINOIS		
Chicago, 16	Illinois Auto Electric Co.	2011-37 Indiana Ave.
Rock Island	Lohse Automotive Service	430 17th Ave.
INDIANA		
Indianapolis, 4	Gulling Auto Electric Inc.	450 No. Capital Ave.
IOWA		
Cedar Rapids	Edwards Carburetor & Electric Co.	209 Seventh St., S.E.
Des Moines	Electrical Service & Sales Co.	1313 Walnut St.
KANSAS		
Wichita, 2	E. S. Cowie Electrical Co.	230 S. Topeka Ave.
KENTUCKY		
Louisville	Schaaf Auto Electric Co.	439 East Broadway
LOUISIANA		
New Orleans	Gerhardt's Fuel Injection Service	734 Girod St.
New Orleans, 13	John M. Walton, Inc.	1050 Carondelet St.
Shreveport	Vaughn Tractor & Auto Parts Co.	224 Airport Drive

AMERICAN BOSCH SERVICE STATIONS

MAINE		
Portland, 5	Portland Tractor Co., Inc.	803 Forest Ave.
MARYLAND		
Baltimore, 1	Parks and Hull Automotive Corp.	1033 Cathedral St.
Baltimore	Stephen Seth & Co.	876 Park Ave.
MASSACHUSETTS		
Boston, 15	W. J. Connell Company	121 Brookline Ave.
Boston, 10	Wharf Mach. & Electric Co., Inc.	Fish Pier Road
Fairhaven	Hathaway Machinery Co. Inc.	Hathaway-Braley Wharf
MICHIGAN		
Detroit	Knorr-Maynard, Inc.	5743 N. Woodward Ave.
MINNESOTA		
Minneapolis	George Nusbaum Diesel Co.	3157 15th Ave. South
Minneapolis, 2	Reinhard Bros. Co., Inc.	11 South 9th St.
MISSISSIPPI		
Jackson	Womack Brothers	1035 South Gallatin St.
MISSOURI		
Kansas City, 8	Electrical & Magneto Service Co.	2538 Grand Ave.
St. Louis, 23	Diesel Fuel Injection Service Co.	9331 So. Broadway
St. Louis, 3	Electric Parts and Service Co.	2900 Washington Blvd.
MONTANA		
Billings	Original Equipment, Inc.	423 North Broadway
NEBRASKA		
Omaha, 2	Carl A. Anderson, Inc.	16th and Jones
NEW JERSEY		
Newark, 2	Tire Trading Company, Inc.	239 Halsey St.

AMERICAN BOSCH SERVICE STATIONS

NEW YORK

Brooklin, 9
Bolivar
Buffalo, 8
New York, 19

Syracuse, 4
Troy
Utica

E. A. Wildermuth, Inc.
Bolivar Magneto Co.
Hetzrich Electric Service
American Bosch Corp., New York
Sales and Service Division

F. A. Crossman, Inc.
Ehrlich Electric Service, Inc.
Stiefvater Electric Co., Inc.

1102 Atlantic Ave.
60 Wellsville St.
1032 Ellicott St.
601 W. 51st Street

943 West Genesee St.
200 Fourth St.
320-322 Lafayette St.

NORTH CAROLINA

Charlotte

Carolina Rim & Wheel Co. 312 N. Graham St.

NORTH DAKOTA

Fargo

Northwestern Diesel Equipment Service 2800 Front St.

OHIO

Cincinnati
Cleveland, 14
Columbus, 15
Lisbon

Tri-State Distributing Corp.
The Cleveland Ignition Co.
Columbus Ignition Co.
Diesel Service Co.

Broadway at Eight
1301 Superior Ave.
211 Neilston Ave.
234 East Washington St.

OKLAHOMA

Oklahoma City, 2
Tulsa

American Electric-Ignition Co.
Magneto Ignition Company

124 N. W. 8th St.
701 West 5th St.

OREGON

Klamath Falls
Pendleton
Portland, 14
Roseburg

Diesel & Electric Service
Eds Magneto & Diesel Co.
Automotive Products Inc.
Diesel Products Co.

1950 So. Sixth St.
S.W. 18th and Court St.
1700 Southeast Grand Ave.
1817 N. Stephens St.

PENNSYLVANIA

Hazleton
Philadelphia
Pittsburgh, 13

Anthracite Injection Co.
Sullivan Brothers
Automotive Ignition Co., Inc.

30th and North Church Sts.
1718 Fairmont Ave.
4917-4919 Baum Blvd.

SOUTH CAROLINA

Charleston

Diesel Fuel Injection Service

Adger's Wharf, P.O.
Box 512

AMERICAN BOSCH SERVICE STATIONS

TENNESSEE

Knoxville
Memphis, 4

Diesel-Magneto Service Co.
Automotive Elec. Service Co.

1209 Island Home Ave.
982 Linden Ave.

TEXAS

Dallas, 1
Houston, 1
Odessa
El Paso
San Antonio
San Antonio

Beard & Stone Electric Co., Inc.
Beard & Stone Electric Co., Inc.
Electric Service & Supply
Oakes Battery & Electric Co. Inc.
S. X. Callahan
Womack Bros.

2101 Byran St.
805 Polk Ave., P.O. Box 1717
P.O. Box 1471
423 Texas St.
425 N. Flores St.
1018 S. Presa St.

UTAH

Salt Lake City, 2

Koepsel & Love

47 East 7th South St.

VIRGINIA

Norfolk
Richmond

Diesel Injection Sales and Service
C. H. Woodward Electric Co., Inc.

710 Union St.
709 W. Broad St.

WASHINGTON

Rosalia
Seattle
Seattle
Spokane
Walla Walla

Van's Diesel Electric Co.
Sunset Electric Co.

Seattle Injector Co.
Sunset Electric Co.
Industrial Products Co.

P.O. Box 560
300 Westlake North, P.O.
Box 3148
2706 Second Ave.
North 703 Division St.
610 No. Ninth St.

WEST VIRGINIA

Hurricane

Beard Engine Equipment Co.

3474 Teays Valley Road

WISCONSIN

Milwaukee, 2

Wisconsin Magneto Company

918 N. Broadway

AMERICAN BOSCH SERVICE STATIONS

Foreign

		ALGERIA
Algiers	Societe Algerienne de Representations Industrielles	25 Boulevard Baudin
		ARGENTINA
Buenos Aires	Arthr E. Jones y Cia. S.R. Ltda.	O'Brien 1163
Buenos Aires	Agar, Cross & Co. Ltd.	Casilla Correo 497
Buenos Aires	Bruno T. Belvisi	Calle Spiro & Avenue J. D. Peron, Adrogue
		AUSTRALIA
Adelaide	A. G. Healing Ltd.	151 Pirie Street
Adelaide	Commercial Motor Vehicles Ltd.	217 Franklin Street
Brisbane	Dennis Equipment Co. Pty. Ltd.	848 Ann Street
East Sydney	Pyrox Limited	18-20 Albion St.
Hobart, Tasmania	W. A. Richards	56 Collins Street
Launceston, Tasmania	Bell's Auto Electric Service	166 Brisbane Street
Melbourne, N. 3	Pyrox Limited	Cor. Queensbury and Drummond Sts.
Perth, West Australia	M. J. Bateman Ltd.	12 Milligan Street
		BELGIUM
Bruxelles	Allumage Lumiere S. A.	23-25 Rue Lambert Crickx
		BRAZIL
Sao Salvador, Baia	Compania Brasileira de Maquinaria	Rua Comendador Araujo, No. 230 and 252
Curitiba Parana	Rocka y Compania	Rua Riachuelo, 243
Rio de Janeiro	Borghoff S. A.	Av. Gen. Olimpio da Silveira, 63
Sao Paulo	Borghoff S. A.	Rua Bento Freitas, 131
Sao Paulo	Irmaos Carneiro & Cia, Ltda.	Rua Maria Tereza, 125
Sao Paulo	Sao Paulo Importadora de Motores S. A.	
Porto Alegro, R.G.S.	Ricardo Landgraf	Rua 7 de Setembro, 806
Recife, Pernambuco	Compania Brasileira de Maquinaria	Rua da Moeda, 129
Rio de Janiero	Francesco Rebacchi	Rua Frei Caneca, 36
		CEYLON
Colombo	B. J. Fernando & Company	215, Cotta Road, Borella
		CHILI
Concepcion	Herman Hnos. & Gastellu Ltda.	Casilla 15-C
Santiago	Herman Hnos. & Cia. Ltda.	Al. B. O'Higgins No. 1850

AMERICAN BOSCH SERVICE STATIONS

CHINA

Shanghai	China Diesel Motors Corp.	56 Mowning Road, Southern 4A, Des Voeux Road Central
Hong Kong	Gilman & Co. Ltd.	
		COLOMBIA
Bogota	G. Pradilla & Cia. S.A.	Calle 13, Numero 30-78
		BURMA
Rangoon	The East Asiatic Co. Ltd.	577 Merchant Street
		CUBA
Havana	E. Boher y Cia. Service Station at Joaquin Alemany	San Jose No. 155 Lopez Avenida Menocal (Infanta) 1106 Habana No. 86
Havana	Companis Riera, Toro and Van Twistern, S.A.	
		DENMARK
Copenhagen	Aktieselskabet Magneto Gorlov Service	Jagtvej 155 Strandvej 40 — Hellerup
		EGYPT
Cairo	Edgard Eid Misr Engineering and Car. Co.	12 Malika Farida St. 2 Champolion Street
Cairo		
		EIRE
Cork	D. H. Sherrard & Company Ltd. Traders' Magneto & Dynamo Co.	Parnell Place 35 South William Street
Dublin		
		ENGLAND
Peterborough	Burchnell's (Peterborough) Ltd.	London Road
San Salvador	EL SALVADOR	Calle Ruben Dario No. 58
	Casa Saprissa, S.A.	
		FRANCE
Paris, 100 Strasbourg	Etablissements Denis & Gandard Cidape	9 & 9 Bis, Rue d'Abbeville 13, Rue St. Aurelie
Casablanca	FRENCH MOROCCO	87 Boulevard Pasteur
	A. Kaufman Auto-Accessoires	

AMERICAN BOSCH SERVICE STATIONS

GREECE

Athens Jason Th. Galanos & Co. No. 59, 28th October St.

INDIA

Bombay Mousell & Co. Ltd. Lotus House, Marine Lines
Calcutta Mousell & Co. Ltd. Mercantile Building
Madras South Indian Export Co. Ltd. 9/12 Lall Bazar
4 McLean Street

INDONESIA

Djakarta Electro-Import N. V. Menteng 27
Surabaya Electro-Import N. V. Pasar Wetan Besar 25/27

IRAN

Teheran George Ovanesoff Ovanesoff Building

KENYA COLONY

Nairobi The Motor Mart & Exchange Ltd. P.O. Box 179

MEXICO

Ciudad Obregon, Sonora Servicio Auto Electrico, S.A.
Guadalajara, Jal. Electro Diesel de Occidente S. A.
Mexico, D.F. Automoto Service S. A.
Monterrey, Nuevo Leon Electro Diesel S.A.
Torreon, Coahuila Servicio Diesel Electrico, S. de R.L.

Calle Sinaloa No. 400
Calz. Independencia
Sur 396
Fray Servando Teresa de
Mier 242
Esq. Avenida Morelos
y Zuazua
Guadelupe Victoria
No. 216-Sur.

NETHERLANDS

Amsterdam-W N. V. Willem Van Rijn Haarlemmerweg 475

NEWFOUNDLAND

St. John's A. H. Murray and Co. Ltd.

NEW ZEALAND

Wellington Jas. J. Niven & Co. Ltd. 65-67 Taranski Street

NORWAY

Oslo A/S Automagnet Tollbugt 28

AMERICAN BOSCH SERVICE STATIONS

PAKISTAN

Chittagong Mousell & Co. (Chittagong) Ltd. West Sola Shar-Aturer
Dept.
Ramgarh Rd. P.O.
Chowk Bazar

PERU

Lima Auto Servicios Electricos, S. A. Avenida San Carlos 231

PHILIPPINE ISLANDS

Manila Diesel Injection & Magneto Service Co. 910 Cordeleria, Santa Mesa

PORTUGAL

Lisbon Electro Automobilista Sociedade Industrial Agro-Reparadora Ltda. 55, Rua da Gloria, 59
44-45 Campo das Cebolas
46-46A e 48

PORTUGUESE EAST AFRICA

Lourenco Marques F. Bridler & Co. Ltd. P.O. Box 65

PUERTO RICO

San Juan General Farm Equipment Co. Box No. 3588

SIAM

Bangkok Oriental Machinery Stores Worachakr Road

SOUTHERN RHODESIA

Bulawayo Stansfield Ratcliffe & Co. Ltd. P.O. Box 254
Salisbury Stansfield Ratcliffe & Co. Ltd. P.O. Box 1263

SPAIN

Barcelona Autocessorios Harry Walker S.A.E. Rosellon 192

SWEDEN

Stockholm Amerikanska Gunni Aktiebolaget Luntmakergatan 25

SWITZERLAND

Langenthal Ernst Hugli Murgenthalstrasse 30